K S INSTITUTE OF TECHNOLOGY BANGALORE

MECHANICAL ENGINEERING DEPARTMENT

COURSE FILE

NAME OF THE STAFF : **PRASAD K**

SUBJECT CODE/NAME : **15ME71/ ENERGY ENGINEERING**

SEMESTER/YEAR : **VII/ IV**

ACADEMIC YEAR : **2018-2019**

BRANCH : **MECANICAL ENGINEERING**

COURSE INCHARGE

HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

K. S. INSTITUTE OF TECHNOLOGY

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

Course File Contents

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K. S. INSTITUTE OF TECHNOLOGY

VISION: "To impart quality technical education with ethical values, employable skills and research to achieve excellence"

MISSION:

- To attract and retain highly qualified, experienced & committed faculty.
- To create relevant infrastructure
- Network with industry & premier institutions to encourage emergence of new ideas by providing research & development facilities to strive for academic excellence
- To inculcate the professional & ethical values among young students with employable skills & knowledge acquired to transform the society

DEPARTMENT OF MECHANICAL ENGINEERING

VISION: "To groom incumbents to compete with their professional peers in mechanical engineering that brings recognition"

MISSION:

- To impart sound fundamentals in mechanical engineering
- To expose students to new frontiers
- To achieve engineering excellence through experiential learning and team work.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1: To produce graduates who would have developed a strong background in basic science and mathematics and ability to use these tools in Mechanical Engineering.

PEO2: To prepare graduates who have the ability to demonstrate technical competence in their fields of Mechanical Engineering and develop solutions to the problems.

PEO3: To equip graduates to function effectively in a multi-disciplinary environment individually, within a global, societal, and environmental context.

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DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM SPECIFIC OUTCOMES (PSO'S)

It is expected that a student in mechanical engineering will possess an:

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

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DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

K.S INSTITUT E OF TECHNOLOGY, Bengaluru-109

CALENDAR OF EVENTS: ODD SEMESTER (2019-2020)

SESSION: JUL 2019 – NOV 2019

Week No.	Month	Day						Days	Activities
		Mon	Tue	Wed	Thu	Fri	Sat		
1	July/Aug	29	30	31	1	2	3DH	5	
2	Aug	5	6	7	8	9DH	10	5	9 - Varamaha lakshmi 10 - Monday Time Table
3	Aug	12H	13	14	15H	16	17	4	12 - Bakrid 15 - Independence Day 17 - Tuesday TimeTable
4	Aug	19	20	21	22	23	24DH	5	
5	Aug	26	27	28	29	30	31	6	31 - Wednesday Time Table
6	Sep	2H	3	4	5	6	7DH	4	2 - Vinayaka chathruthi
7	Sep	9 TA	10H	11T1	12 T1	13 T1	14	5	10 - Moharam 14 - Friday Time Table
8	Sep	16	17	18	19	20BV	21DH	5	16-20 First feed back
9	Sep	23ASD	24 MA	25	26	27	28H	5	28 - Mahalaya Amavasya
10	Sep/Oct	30	1	2H	3	4	5*	5	2 - Gandhi Jayanthi 5-Ayudha pooja in college 5 - Monday Time Table
11	Oct	7H	8H	9	10	11	12 TA	4	7 - Ayudha pooja 8 - Vijaya dasami 12 - Monday Time Table
12	Oct	14 T2	15 T2	16 T2	17	18	19DH	5	
13	Oct	21	22	23 BV	24 ASD	25 MA	26	6	26 - Tuesday Time Table
14	Oct/Nov	28	29H	30	31	1H	2DH	3	29 - Balipadyami 1 - Kannada Rajyothava
15	Nov	4	5	6	7	8	9	6	9 - Tuesday Time Table 4-8 Second feed back
16	Nov	11	12	13	14	15H	16DH	4	15-Kanakadasa Jayanthi
17	Nov	18	19	20	21 LT	22 LT	23 LT	6	
18	Nov	25 T3	26 T3	27T3	28	29 BV ASD	30* MA	6	30 - Thursday Time Table and Last Working Day
TOTAL NO. of Working Days: 89									

H	Holiday
BV	Blue Book Verification
T1,T2,T3	Tests 1,2,3
ASD	Attendance & Sessional Display
DH	Declared Holiday
LT	Lab Test
TA	Test attendance
MA	Master Attendance Filling

Total Number of working days (Excluding holidays and Tests)

Monday	16
Tuesday	15
Wednesday	15
Thursday	16
Friday	15
Total	77

PRINCIPAL
K.S. INSTITUTE OF TECHNOLOGY
BENGALURU - 560 109

K.S INSTITUT E OF TECHNOLOGY, Bengaluru-109

CALENDAR OF EVENTS: ODD SEMESTER (2019-2020)

SESSION: JUL 2019 – NOV 2019

Week No.	Month	Day						Days	Activities	DepartmentActivities
		Mon	Tue	Wed	Thu	Fri	Sat			
1	July/Aug	29	30	31	1	2	3DH	5		
2	Aug	5	6	7	8	9DH	10	5	9 - Varamaha lakshmi 10 - Monday Time Table	
3	Aug	12H	13	14	15H	16	17	4	12 - Bakrid 15 - Independence Day 17 - Tuesday TimeTable	13th - 17th -VII Sem Technical Training Programme
4	Aug	19	20	21	22	23	24DH	5		
5	Aug	26	27	28	29	30	31	6	31 - Wednesday Time Table	29- Technical Talk on HVAC
6	Sep	2H	3	4	5	6	7DH	4	2 - Vinayaka chathruthi	
7	Sep	9 TA	10H	11T1	12 T1	13 T1	14	5	10 - Moharam 14 - Friday Time Table	14th - Technical Talk
8	Sep	16	17	18	19	20BV	21DH	5	16-20 First feed back	
9	Sep	23ASD	24 MA	25	26	27	28H	5	28 - Mahalaya Amavasya	25th - Dept. Parent Teachers Meeting 26th - Industrial Visit V Sem 27th - EMANATION
10	Sep/Oct	30	1	2H	3	4	5*	5	2 - Gandhi Jayanthi 5-Ayudha pooja in college 5 - Monday Time Table	4th -5th - Industrial Visit III Sem
11	Oct	7H	8H	9	10	11	12 TA	4	7 - Ayudha pooja 8 - Vijaya dasami 12 - Monday Time Table	
12	Oct	14 T2	15 T2	16 T2	17	18	19DH	5		18th - Industrial Visit VII Sem
13	Oct	21	22	23 BV	24 ASD	25 MA	26	6	26 - Tuesday Time Table	
14	Oct/Nov	28	29H	30	31	1H	2DH	3	29 - Balipadyami 1 - Kannada Rajyothava	31st - Dept. Parent Teachers Meeting
15	Nov	4	5	6	7	8	9	6	9 - Tuesday Time Table 4-8 Second feed back	9th - Technical Talk
16	Nov	11	12	13	14	15H	16DH	4	15-Kanakadasa Jayanthi	
17	Nov	18	19	20	21 LT	22 LT	23 LT	6		
18	Nov	25 T3	26 T3	27T3	28	29 BV ASD	30* MA	6	30 - Thursday Time Table and Last Working Day	
TOTAL NO. of Working Days: 89										

H	Holiday
BV	Blue Book Verification
T1,T2,T3	Tests 1,2,3
ASD	Attendance & Sessional Display
DH	Declared Holiday
LT	Lab Test
TA	Test attendance
MA	Master Attendance Filling

Total Number of working days (Excluding holidays and Tests)

Monday	16
Tuesday	15
Wednesday	15
Thursday	16
Friday	15
Total	77

Signature of Co ordinator

5/8/19

Head of the Department
Signature of HOD
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

ENERGY ENGINEERING

Course	Code	Credits	L-T-P	Assessment		ExamDuration
				SEE	CIA	
Energy Engineering	15ME71	04	3-2-0	80	20	3 hrs

Course learning objectives is to

- Understand energy scenario, energy sources and their utilization
- Learn about energy conversion methods and their analysis
- Study the principles of renewable energy conversion systems
- Understand the concept of green energy and zero energy.

Module – I

Thermal Energy conversion system: Review of energy scenario in India, General Philosophy and need of Energy ,Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures. Chimneys: Natural, forced, induced and balanced draft, Calculations and numerical involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, Desuperheater, control of superheaters, Economizers, Air preheaters and re-heaters. **9 Hours**

Module – II

Diesel Engine Power System: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

Hydro-Electric Energy: Hydrographs, flow duration and mass curves, unit hydrograph and numerical. Storage and pondage, pumped storage plants, low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.**7 Hours**

Module – III

Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data, Solar Thermal systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems, Solar Photovoltaic systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems **8 Hours**

Module – IV

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines

and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations. **8 Hours**

Module – V

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification. **Green Energy**: Introduction: Fuel cells: Overview; Classification of fuel cells; Operating principles; Fuel cell thermodynamics Nuclear, ocean, MHD, thermoelectric and geothermal energy applications; Origin and their types; Working principles, Zero energy Concepts

8 Hours

Course Outcomes

At the end of the course, the student will be able to:

- Summarize the basic concepts of thermal energy systems,
- Identify renewable energy sources and their utilization.
- Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
- Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas.
- Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
- Identify methods of energy storage for specific applications

TEXT BOOKS:

1. B H Khan, Non conventional energy resources, 3rd Edition, McGraw Hill Education
2. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill. 1996

REFERENCE BOOKS:

1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).
2. C. S. Solanki, "Solar Photovoltaic's: Fundamental Applications and Technologies, Prentice Hall of India, 2009.
3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.

Scheme of Examination: Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

K.S. INSTITUTE OF TECHNOLOGY, BENGALURU - 560109

LIST OF STUDENTS IN VII SEMESTER -B SEC

MECHANICAL ENGINEERING BRANCH

SL. NO.	USN	NAME OF THE STUDENT
1	1KS16ME057	PAVITHRA.B
2	1KS16ME081	SHIVARAJ.N.S
3	1KS16ME082	SHIVASHANKAR.B.M
4	1KS16ME083	SIRISH GOVARDHAN
5	1KS16ME084	SOWJANYA.D
6	1KS16ME085	SREEKARA.K.B
7	1KS16ME086	SUDARSHAN.T
8	1KS16ME087	SUDHARSHAN.M.D
9	1KS16ME089	SUMESH.R
10	1KS16ME090	SUPREETH.K.R
11	1KS16ME093	VARUN.C
12	1KS16ME094	VASANTH KUMAR.S
13	1KS16ME095	VIJAYA KUMAR.M.S
14	1KS16ME096	VIJAYKUMARNAIK.T.C
15	1KS16ME097	VINAY.B.V
16	1KS16ME098	VINAY.V.P
17	1KS16ME099	VINITH.P
18	1KS16ME100	VITHAN.T.R
19	1KS16ME101	ABHIJITH.C
20	1KS16ME102	MADHU.G.K
21	1KS16ME104	RAGHU.S
22	1KS16ME105	RAKESH.B.R
23	1KS17ME401	ARUNKUMAR.E
24	1KS17ME402	ARUN KUMAR.R
25	1KS17ME404	CHETHAN.C.R
26	1KS17ME405	DARSHAN.H.R
27	1KS17ME406	DEEPAK.E
28	1KS17ME407	DEVIPRASAD.M
29	1KS17ME408	GUHAN BHASKAR
30	1KS17ME409	GURUPRASAD.T.M
31	1KS17ME410	GURUSWAMY.H
32	1KS17ME411	JEEVAN ABHISHEK
33	1KS17ME412	KANTHARAJU.K.N
34	1KS17ME413	KIRAN.S
35	1KS17ME415	LOHITH.R
36	1KS17ME416	MAHADEVA RAJU.H.E
37	1KS17ME417	MAHESH.D
38	1KS17ME418	MANISH.N.D
39	1KS17ME419	MITHUN.S
40	1KS17ME420	MOHAN KUMAR.C
41	1KS17ME421	MOHAN KUMAR.K
42	1KS17ME422	NAGESH.S
43	1KS17ME423	NIKHIL GOWDA.N.S
44	1KS17ME425	PRATAP.L
45	1KS17ME426	PRATHEEK.P
46	1KS17ME430	RAKESH.B.R
47	1KS17ME431	RAKSHITH.L
48	1KS17ME432	RAVI.K.R
49	1KS17ME434	SHASHANK.Y.K
50	1KS17ME435	SHASHIKUMAR.C.R
51	1KS17ME437	SRINIVASA.B.V
52	1KS17ME439	SURABHI.N
53	1KS17ME440	SUSHMA.Y.S
54	1KS17ME441	TEJAS.P.N
55	1KS17ME442	THRIVENI.M
56	1KS17ME444	VINAY.S

Signature of Staff

Signature of HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109

DEPARTMENT OF MECHANICAL ENGINEERING

INDIVIDUAL TIME TABLE FOR THE YEAR 2019-20 (ODD SEMESTER)

NAME : K. Prasad
W.E.F. : 29/7/2019

Designation : Associate Professor

PERIOD	1	2	3	4	12:25 - 1:30	5	6	7
TIME/ DAY	8:30 -9:25	9:25 - 10:20	10:35 -11:30	11:30 - 12:25		1:30 -2:25	2:25 -3:20	3:20 - 4:15
MON		EE (VII B) (15ME71)		TM (VA) (17ME53)	Lunch Break	FM LAB (B1) (17MEL57)		
TUE	TM (VA) (17ME53)			EE (VII B) (15ME71)		Energy Lab (A2) (17MEL58)		
WED						TM (VA) (17ME53)		
THU		EE (VII B) (15ME71)	TM (VA) (17ME53)					
FRI	Energy Lab (A3) (17MEL58)			EE (VII B) (15ME71)			TM (VA) (17ME53)	
SAT								

	Subject Code	Subject Name	Sem	Section	Work Load
SUBJECT-1	17ME53	Turbo Machines	V	A	5
SUBJECT-2	15ME71	Energy Engineering	VII	B	4
LAB-1	17MEL57	Fluid Mechanics & Machinery Lab	V	B	3
LAB-2	17MEL58	Energy Lab-	V	A	6
PROJECT	-	-	-	-	-
ADDITIONAL WORK: Workshop Superintendent/ Time Table & Academic Coordinator/ MENTORING & OTHERS					
TOTAL LOAD= 18 Hrs/Week					

Time Table Co-Ordinator
24/7/19

HOD 24/7/19

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

Principal 24.7.19

DEPARTMENT OF MECHANICAL ENGI[illegible]ERING

ODD SEMESTER - AUG to DEC 2019

Class Teacher : Mrs. Sreesudha N

SECTION: VII B

NEW BUILDING LH -

W.E.F:29/07/2019

PERIOD	1	2	10:20	3	4	12:25	5	6	7
TIME/DAY	8:30 - 9:25	9:25 - 10:20		10:35 - 11:30	11:30 - 12:25		1:30 - 2:25	2:25 - 3:20	3:20- 4:15
MON	FPS (15ME72)	EE (15ME71)	BREAK	TRI (15ME742)	MECH (15ME753)	LUNCH BREAK	CE (15ME73)	FPS (15ME72)	MECH (15ME753)
TUE	CE (15ME73)	TRI (15ME742)		FPS (15ME72)	EE (15ME71)		Design lab (15MEL76) (B1) / CIM Lab (15MEL77) (B2)/ Project Phase– I (15MEP78)(B3)		
WED	Design lab (B2) /CIM Lab (15MEL77)(B3)/ Project Phase– I (15MEP78) (B1)				FPS (15ME72)		TRI (15ME742)	CE (15ME73)	T
THU	MECH (15ME753)	EE (15ME71)	TEA	CE (15ME73)	TRI (15ME742)		Design lab(B3)/ CIM Lab (15MEL77) (B1)/ Project Phase– I (15MEP78) (B2)		
FRI	FPS (15ME72)	MECH (15ME753)		CE (15ME73)	EE (15ME71)		MECH (15ME753)	TRI (15ME742)	T
SAT									

Subject Code	Subject Name	Faculty Name
15ME71	Energy Engineering	Mr.Prasad K
15ME72	Fluid Power Systems	Mr.Gautham S
15ME73	Control Engineering	Mrs. Sreesudha N
15ME742	Tribology	Mr.Girish.T.R
15ME753	Mechatronics	Mr.Bharath Kumar K R
15MEL76	Design lab	Mr.Girish.T.R (B1,B3), Mr. Kaushik M M (B2)
15MEL77	CIM Lab	Mr. Bharath Kumar K R (B2, B3) , Mrs. Sreesudha N (B1)
15MEP78	Project Phase– I	Dr. AJS/UMS/NK/SS/LN/MBR/GAB

CO- ORDINATOR

24/7/19

24/7/19

HEAD OF THE DEPARTMENT

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

PRINCIPAL

24.7.19

K S INSTITUTE OF TECHNOLOGY, BENGALURU-109

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN FOR THE ACADEMIC YEAR OF 2019-2020

SUBJECT : ENERGY ENGINEERING **SUBJECT CODE : 15ME71**

FACULTY : prasad k **SEMESTER/SECTION : 7 th A&'B '** **W.E.F : 29/07/2019**

COURSE OBJECTIVES :

Students will be

1. Understand energy scenario,energy sources and their utilization.
2. Learn about energy conversion methods and their analysis.
3. Study the principles of renewable energy conversion systems.
4. Understand the concept of green energy and zero energy.

COURSE OUTCOMES :

After completing this course students should be able to

1. Summarize the basic concepts of thermal energy systems,
2. Identify renewable energy sources and their utilization.
3. Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
4. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas.
5. Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
6. Identify methods of energy storage for specific applications

COURSE CONTENTS :

PERIOD	MODULE	TOPICS	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
1	1	Thermal Energy conversion system: Review of energy scenario in India, General Philosophy and need of Energy ,Different Types of Fuels used for steam generation.	L	BB+LCD	1	1	29-07-19
2	1	Equipment for burning coal in lump form, strokers,	L	BB+LCD	1	2	30-07-19
3	1	different types, Oil burners, Advantages and Disadvantages of using pulverized fuel	L	BB+LCD	1	3	01-08-19
4	1	Equipment for preparation and burning of pulverized coal, unit system and bin system	L	BB+LCD	1	4	02-08-19
5	1	Pulverized fuel furnaces, cyclone furnace, Coal and ash handling,	L	BB+LCD	1	5	05-08-19
6	1	**Generation of steam** using forced circulation, high and supercritical pressures	L	BB+LCD	1	6	06-08-19
						7	08-08-19
7	1	Chimneys: Natural, forced, induced and balanced draft,	L	BB	1	8	09-08-19
8	1	Calculations and numerical involving height of chimney to produce a given draft. Cooling towers and Ponds.	L	BB	1	9	13-08-19
9	1	Accessories for the Steam generators such as Superheaters,	L	BB+LCD	1	10	16-08-19
10						11	17-08-19
11	1	De-super heater, control of superheaters, Economizers, Air preheatersand re-heaters	L	BB+LCD	1	12	19-08-19
12	2	**Diesel Engine Power System:** Applications of Diesel Engines in Power field.	L	LCD	1	13	20-08-19
13	2	Method of starting Diesel engines.	L	LCD	1	14	22-08-19
14	2	Auxiliaries like cooling and lubrication	L	BB+LCD	1	15	23-08-19
15	2	filters, centrifuges, Oil heaters, intake and exhaust system	L	BB+LCD	1	16	26-08-19
16	2	Layout of diesel power plant.	L	BB+LCD	1	17	27-08-19
17	2	**Hydro-Electric Energy:** Hydrographs, flow duration and mass curves	L	BB+LCD	1	18	29-08-19
18	2	Unit hydrograph and numerical.	L	BB+LCD	1	19	30-08-19
19	2	Storage and pondage, pumped storage plants	L	BB+LCD	1	20	19-08-19
20	2	Low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves.	L	BB+LCD	1	21	03-09-19
21	2	General layout of hydel power plants.	L	LCD	1	22	05-09-19
22	3	Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces;	L	BB+LCD	1	23	06-09-19
23	3	Measurement of solar radiation data, Solar	L	BB+LCD	1	24	09-09-19
24		**TEST-1**					11-09-19
25	3	Thermal systems: Introduction; Basics of thermodynamics and heat transfer	L	BB+LCD	1	25	14-09-19
26	3	Flat plate collector; Evacuated Tubular Collector; Solar air collector;	L	BB+LCD	1	26	16-09-19
27	3	Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning	L	BB+LCD	1	27	17-09-19
28	3	Thermal energy storage systems,	L	BB+LCD	1	28	19-09-19
29	3	Photovoltaic systems: Introduction; Solar cell Fundamentals;	L	BB+LCD	1	29	20-09-19
30	3	Characteristics and classification; Solar cell:	L	BB+LCD	1	30	23-09-19
31	3	Module, panel and Array construction;	L	BB+LCD	1	31	24-09-19
32	3	Photovoltaic thermal systems	L	BB+LCD	1	32	26-09-19
33	4	**Wind Energy:** Properties of wind, availability of wind energy in India,	L	BB+LCD	1	33	27-09-19
34	4	wind velocity and power from wind; major problems associated with wind powerwind machines;	L	BB+LCD	1	34	30-09-19
35	4	Types of wind machines and their characteristics,	L	BB+LCD	1	35	01-10-19
36	4	horizontal and vertical axis wind mills	L	BB+LCD	1	36	03-10-19
37	4	Coefficient of performance of a wind mill rotor(Numerical Examples).	L	BB+LCD	1	37	04-10-19
38	4	Numerical for Wind Mills	L	BB+LCD	1	38	05-10-19

39	4	Numerical for Wind Mills	L	BB+LCD	1	39	10-10-19
40	4	Numerical for Wind Mills	L	BB+LCD	1	40	11-10-19
41	4	Numerical for Wind Mills	L	BB+LCD	1	41	12-10-19
42		**TEST-2**					14-10-19
43	4	Coefficient of performance of a wind mill rotor(Numerical Examples).	L	BB+LCD	1	42	17-10-19
44	4	Tidal Power: Tides and waves as energy suppliers and their mechanics	L	BB+LCD	1	43	18-10-19
45	4	fundamental characteristics of tidal power	L	BB+LCD	1	44	21-10-19
46	4	fundamental characteristics of tidal power	L	BB+LCD	1	45	22-10-19
47	4	harnessing tidal energy,	L	BB+LCD	1	46	24-10-19
48	5	Biomass Energy: Introduction; Photosynthesis Process;	L	BB+LCD	1	47	25-10-19
49	5	Biofuels; Biomass Resources;	L	BB+LCD	1	48	26-10-19
50						49	28-10-19
51	5	Biomass conversion technologies;	L	BB+LCD	1	50	31-10-19
52	5	Urban waste to energy conversion	L	BB+LCD	1	51	04-11-19
53	5	Biomass gasification	L	BB+LCD	1	52	0511-2019
54	5	**Green Energy:** Introduction: Fuel cells: Overview;	L	BB+LCD	1	53	07-11-19
55	5	Classification of fuel cells;	L	BB+LCD	1	54	08-11-19
56	5	Operating principles; Fuel cell thermodynamics Nuclear,	L	LCD	1	55	0911-2019
57	5	Ocean	L	LCD	1	56	11-11-19
58	5	MHD	L	LCD	1	57	12-11-19
59	5	Thermoelectric and geothermal energy applications;	L	LCD	1	58	14-11-19
61	5	Origin and their types; Working principles, Zero energy Concepts	L	LCD	1	59	18-11-19
62		Revision	L	BB+LCD	1	60	19-11-19
63		**TEST-3**					25-11-19

TEXT BOOK:

1. B H Khan, Non-conventional energy resources, 3rd Edition, McGraw Hill Education
2. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill. 1996

REFERENCES:

1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).
2. C. S. Solanki, "Solar Photovoltaic's: Fundamental Applications and Technologies, Prentice Hall of India, 2009.
3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990

SIGNATURE OF THE FACULTY

SIGNATURE OF THE HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

K. S. INSTITUTE OF TECHNOLOGY

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

CO-PO MAPPING: ENERGY ENGINEERING

Course : Energy Engineering			
Course Incharge : Prasad k			
Type: Core		**Course Code:** 15ME71	
No of Hours per week			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	4	40
Marks			
CIE Marks	**SEE Marks**	Total	Credits
20	80	100	4

Aim/Objective of the Course:

This Course will enable students to:

1. Understand energy scenario, energy sources and their utilization.
2. Learn about energy conversion methods and their analysis
3. Study the principles of renewable energy conversion systems.
4. Understand the concept of green energy and zero energy

Course Learning Outcomes:

After completing the course, the students will be able to, Bloom's Level

CO1	**Summarize** the basic concepts of Thermal energy systems, Diesel power plant, Hydel power plant, renewable energy sources and their utilization.	**K2- UNDERSTANDING**
CO2	**Understand** the basic concepts of solar energy , Green energy ,zero energy and energy from alternate sources .	**K2- UNDERSTANDING**
CO3	**Apply** the basic concepts for Thermal and Hydel power plant	**K3-APPLYING**
CO4	**Make use of the** basic concepts Solar and Wind energy	**K3-APPLYING**
CO5	**Identify** the concepts and applications of Bio mass energy ,Green energy and zero energy.	**K3- APPLYING**

Module 1: Thermal Energy conversion system: Review of energy scenario in India, General Philosophy and need of Energy ,Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, stokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures. Chimneys: Natural, forced, induced and balanced draft, Calculations and numerical involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Super heaters, De- super heater, control of super heaters, Economizers, Air preheaters and re-heaters. LO: At the end of this session the student will be able to, 1. Classify equipment's used for burning the coal 2. Discus the coal handling and ash handling system in thermal power plant 3. Explain the generation of steam using forced circulation with high & super critical pressure	**CO1,CO3** **10 hrs** PO1-3,3 PO2-2 PO3-1 PO4-1 PO5-1 PO6-1 PO7-1 PO9-1 PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO7-1 PO9-1
Module2 **Diesel Engine Power System:** Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant. **Hydro-Electric Energy:** Hydrographs, flow duration and mass curves, unit hydrograph and numerical. Storage and pond age, pumped storage plants, low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants. LO: At the end of this session the student will be able to, 1. Explain the methods of starting diesel engine and function of auxiliaries 2. Understand the function of penstock, surge tank, gates and valve 3. Solve the Numericals on hydrograph & mass curve	**CO1, CO3.** **10 hrs.** PO1-3 PO2-2 PO3-1 PO4-1 PO5-1 PO6-1 PO7-1 PO9-1 PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO7-1 PO9-1

Module 3 Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data, Solar Thermal systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems, Solar Photovoltaic systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems LO: At the end of this session the student will be able to, 1. Derive the expression for estimation of solar radiation on horizontal and vertical surfaces 2. Understand the concept of flat plate collector, solar cooker and solar refrigeration and solar air conditioning 3. Explain working principle of solar Photo voltaic system .	**CO2,CO4 .** **10 hrs** PO1-3 PO2-2 PO3-1 PO6-2 PO7-1 PO9 -1 PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO7-1 PO9 -1
Module 4 Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples) Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations. LO: At the end of this session the student will be able to, 1. Analyze the wind velocity and wind power, problem associated with wind power 2. Classify the wind machines 3. Understand the concept of tides and waves as energy suppliers 7 their mechanics.	**CO2,CO4.** **10 hrs** PO1-3 PO2-2 PO3-1 PO6-2 PO7-1 PO9 -1 PO1-3 PO2-3 PO3-2 PO4-1 PO5-1 PO6-1 PO7-1 PO9 -1
Module 5: Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification. Green Energy: Introduction: Fuel cells: Overview; Classification of fuel cells; Operating principles; Fuel cell thermodynamics Nuclear, ocean, MHD, thermoelectric and geothermal energy applications; Origin and their types; Working principles, Zero energy Concepts	**CO2,CO5.** **10 hrs** PO1-3 PO2-2 PO3-2 PO6-2 PO7-1

LO: At the end of this session the student will be able to, 1. Explain biomass energy systems and biomass gassification 2. Understand the concept of geothermal energy 3. Analyze the concepts of zero energy	PO9 -1 PO12-1
Text Books: - 1. B H Khan, Non conventional energy resources, 3rd Edition, McGraw Hill Education 2. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill. 1996	
Reference Books: 1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984). 2. C. S. Solanki, "Solar Photovoltaic's: Fundamental Applications and Technologies, Prentice Hall of India, 2009. 3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990	
Useful websites: www.energyindian.com https://nptel.ac.in/courses/112/107/112107291/ https://www.academia.edu/10042875/ENERGY_ENGINEERING www.energyindian.com	
Useful Journals Journal of Energy Engineering **https://ascelibrary.org/journal/jleed9**	
Teaching and Learning Methods: 1. Lecture class: 40hrs. 2. Self-study: 4hrs. 3. Field visits/Group Discussions/Seminars: 3hrs. Practical classes: 3hrs.	
Type of test/examination: Written examination: **Assessment:** Type of test/examination: Written examination **Continuous Internal Evaluation(CIE)** : 20 marks (Average of best two of total three tests will be considered) **Semester End Exam(SEE)** : 80 marks (students have to answer all main questions) Test duration: 1 :30 hr Examination duration: 3 hrs	

CO - PO MAPPING

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Sustainability **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Management & Finance **PO12:**Life long Learning

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

Co-Po Mapping Table

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	2	1	_	_	3	3	2	2	2	_	2	3	1
CO2	3	2	1	_	_	3	3	2	2	2	_	2	3	2
CO3	3	3	2	1	1	3	3	2	2	2	_	2	3	2
CO4	3	3	2	1	1	3	3	2	2	2	_	2	3	2
CO5	3	2	2	_	_	3	3	2	2	2	_	2	3	2
AVG	3.00	2.40	1.60	1.00	1.00	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	1.80

Justification for CO-PO mapping

CO -Subject Code	Justification for PO mapping
CO1	PO1-3: Student s gains knowledge of **entire** thermal power station ,Diesel power plant and Hydel power plant PO2-2: Student s calculates the size of draught systems and mass curve for hydel power plant. PO3-1: Student are able to design **only few** parameter(viz; chinmney etc) in the entire thermal power plant and hydel power plant PO4-1: Student is able to investigate problems related to few devices in both the plant PO5-1:Usage of thermal software (viz; CFD) to solve **simple** fluid flow problem was done. PO6-1: Student will realize that Instead of Large size Hydel power plant;micro hydel power plant can be helpful for society PO7-1: Student will know that **only** large size Hydel power and thermal power plant are environment hazzardness. PO9-1: Students had an opportunity to work in teams to visit the **only one** power plant
CO2	PO1:3 Student s gains knowledge about the potential and utilization of **all** form of renewable energy sources PO2-2: Student's calculates performance of **only two** renewable energy sources viz; Solar and Wind energy PO3-1: Student identifies the parameters in 'biogas digester'a device related to **only** biomass renewable energy sources PO4-1: Student's investigates the effect of latitude, hour angle related to **only** solar utilization. PO6-2: Student's examines the awareness in the society towards the need of renewable energy sources.. PO7-1: Student's knows the impact of nuclear waste on environment PO9- 1: Student's will be eager to work in teams for particular projects on 'biogas,

	gasifiers and solar applications'
CO3	PO1-3: Student s gains knowledge of **entire** thermal power station ,Diesel power plant and Hydel power plant PO2-2: Student s calculates the size of draught systems and mass curve for hydel power plant. PO3-1: Student are able to design **only few** parameter(viz; chinmney etc) in the entire thermal power plant and hydel power plant PO4-1: Student is able to investigate problems related to few devices in both the plant PO5-1:Usage of thermal software (viz; CFD) to solve **simple** fluid flow problem was done. PO6-1: Student will realize that Instead of Large size Hydel power plant;micro hydel power plant can be helpful for society PO7-1: Student will know that **only** large size Hydel power and thermal power plant are environment hazzardness. PO9-1: Students had an opportunity to work in teams to visit the **only one** power plant
CO4	PO1:3 Student s gains knowledge about the potential and utilization of **all** form of renewable energy sources PO2-2: Student's calculates performance of **only two** renewable energy sources viz; Solar and Wind energy PO3-1: Student identifies the parameters in 'biogas digester'a device related to **only** biomass renewable energy sources PO4-1: Student's investigates the effect of latitude, hour angle related to **only** solar utilization. PO6-2: Student's examines the awareness in the society towards the need of renewable energy sources.. PO7-1: Student's knows the impact of nuclear waste on environment PO9- 1: Student's will be eager to work in teams for particular projects on 'biogas, gasifiers and solar applications'
CO5	PO1-3: Student s gains **more** knowledge about the various energy technology PO2-2: Student's calculates **only** volume of digester and other parameters are not calculated PO3-2 : Student involve in Design of 'biogas digester' a device related to **only** biomass renewable energy sources PO6-2: Student's realize the positive impact of green energy and zero energy on society at large. PO7-1: Student's will only realize the positive impact on environment of green energy and zero energy but unable to 'physically' reduce it. PO9 -1: Student's will be eager to work in teams for particular projects on 'biogas' PO12-1: Student's will get to know that Awareness about 'green energy' is a continues process

CO PO mapping for the events conducted after gap identification

Sl. No.	Gap Identification	CO	Relevant PO Mapping
1 2	**Mini Projects,** **Group discussion**	**CO1,CO2,CO3,CO4,CO5**	PO5 :Mapped to 1 as students will design & Analyse algorithm using any tool PO6 : Mapped to 1 as students will design & Analyse algorithm using software tool. PO9 &PO10: Mapped to 1 as students will take up mini projects & present the same

Signature of Course in-Charge

Signature of HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

KSIT Bangalore

DEPARTMENT OF MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Academic Year	2019-2020		
Batch	2016		
Year/Semester/section	IV/VII/A&B		
Subject Code-Title	15ME71		
Name of the Instructor	Prasad k	Dept	ME

Assignment No: 1 **Total marks: 20**
Date of Issue: 20/09/19 **Date of Submission: 30/09/19**

Sl.No	Assignment Questions	K Level	CO	Marks
1.	**Discuss** the requirements of pulverized coal burners. Sketch and **explain** a cyclone burner with advantages and disadvantages.	K2	CO1	2
2.	**Explain** with neat sketch overfeed and underfeed principle of firing coal.	K2	CO1	2
3.	**Sketch** and explain traveling grate stoker	K2	CO1	2
4.	**Explain** with a neat sketch the Benson and Velox boiler	K2	CO1	2
5.	**Construct** the schematic layout of the diesel power plant to explain the function of the components	K2	CO2	2
6.	**Discuss** the various starting methods used for Diesel engine and explain	K2	CO3	2
7.	**Identify** the necessities of cooling system for Diesel engine. With the help of neat sketch, explain the thermostat cooling and thermo symphon cooling	K3	CO3	2
8.	**Identify** the advantages , limitations and applications of Diesel power plant	K3	CO3	2
9.	**Derive** the expression of height of chimney	K3	CO3	2
10.	**Estimate** the height of chimney required to produce a static draft of 18 mm of water if the mean temperature of the flue gases in the chimney is 260^{0}C and the temperature of outside air is 25^{0}C. The densities of atmospheric air and flue gases at NTP are 1.293 and 1.34 kg/m^3 respectively	K3	CO3	2

Signature of Staff

for,

Signature of HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109

I SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET – A

USN | | | | | | | | | | |

Degree : **B.E** **Semester : VII**

Branch : **Mechanical Engineering** **Course Code : 15ME71**

Course Title : **ENERGY ENGG** **Date : 23-09-2019**

Duration : **90 Minutes** **Max Marks : 30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks	CO mapping	K-Level
	PART-A			
1(a)	**Explain** with neat sketch overfeed and underfeed principle of firing coal.	6	CO1	Understanding
(b)	**Construct** the schematic layout of the diesel power plant to explain the function of the components	9	CO3	Applying
	OR			
2(a)	**Discuss** the requirements of pulverized coal burners. Sketch and **explain** a cyclone burner with advantages and disadvantages.	6	CO1	Understanding
(b)	**Identify** the necessities of cooling system for Diesel engine. With the help of neat sketch, explain the thermostat cooling and thermo symphon cooling	9	CO3	Applying
	PART-B			
3(a)	Briefly **explain** the function of Air pre heater and super heater in thermal power plants.	4	CO1	Understanding
(b)	With a neat sketch , **explain** the working of spreader stoker and **write a note** on advantage and disadvantages.	5	CO1	Understanding
(c)	**Identify** the advantages , limitations and applications of Diesel power plant	6	CO3	Applying
	OR			
4(a)	**Explain** with a neat sketch the Benson boiler	4	CO1	Understanding
(b)	**Discuss** the various starting methods used for Diesel engine and explain	5	CO1	Understanding
(c)	**Derive** the expression of height of chimney	6	CO3	Applying

Signature of course in charge

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Dept. of Mechanical Engg.
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Bengaluru - 560 109.

K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109

I SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET – B

USN | | | | | | | | | | |

Degree : B.E **Semester** : VII

Branch : Mechanical Engineering **Course Code** : 15ME71

Course Title : ENERGY ENGG **Date** : 23-09-2019

Duration : 90 Minutes **Max Marks** : 30

Note: Answer ONE full question from each part.

Q No.	Question	Marks	CO mapping	K-Level
	PART-A			
1(a)	**Sketch** and explain traveling grate stoker	6	CO1	Understanding
(b)	**Identify** the necessities of cooling system for Diesel engine. With the help of neat sketch, explain the thermostat cooling and thermo symphon cooling	9	CO3	Applying
	OR			
2(a)	**Sketch** and explain bowl pulverizing mill.	6	CO1	Understanding
(b)	**Construct** the schematic layout of the diesel power plant to explain the function of the components	9	CO3	Applying
	PART-B			
3(a)	**Explain** the Hydraulic ash handling system with a neat sketch	4	CO1	Understanding
(b)	**Discuss** the various starting methods used for Diesel engine and explain	5	CO1	Understanding
(c)	**Estimate** the height of chimney required to produce a static draft of 18 mm of water if the mean temperature of the flue gases in the chimney is 260^0C and the temperature of outside air is 25^0C. The densities of atmospheric air and flue gases at NTP are 1.293 and 1.34 kg/m^3 respectively	6	CO3	Applying
	OR			
4(a)	**Explain** with a neat sketch the Velox boiler	4	CO1	Understanding
(b)	**Explain** the following: i) Natural draught ii) Forced draught iii) Induced draught iv) Balanced draught	5	CO1	Understanding
(c)	**Identify** the advantages , limitations and applications of Diesel power plant	6	CO3	Applying

Signature of course in charge

for,

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

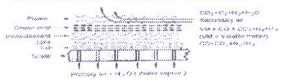
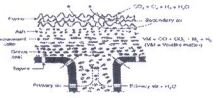
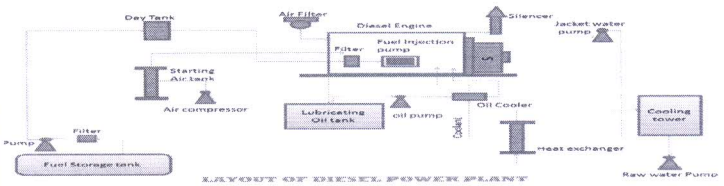
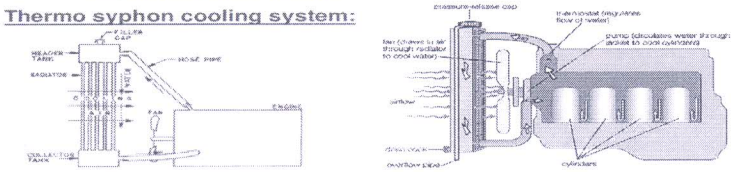
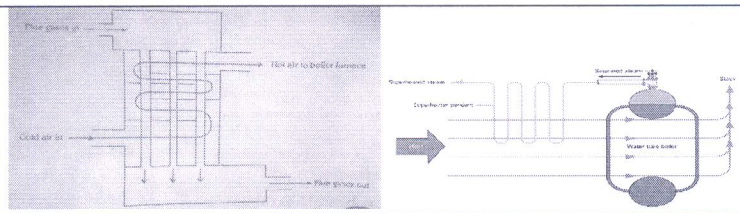
Signature of HOD

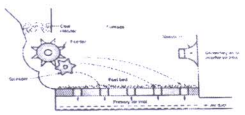
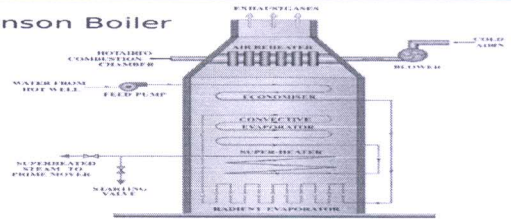
K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109
I CIE TEST QUESTION PAPER 2019 – 20 ODD SEMESTER
SCHEME OF EVALUATION

SET – A

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**ENERGY ENGG**	**Date**	:	**23-09-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	POINTS	Marks Split	Total Marks
1(a)	Overfeed Stokers Mechanism • In Overfeed Stokers the coal is fed into the grate above the point of air admission.  Underfeed Stokers Mechanism • In Underfeed Stokers the coal is admitted below the furnace below the point of air admission. Actually both air and fuel entering in the same direction. • These are suitable for burning Bituminous coal.  Explanation	4+3	6
(b)	 LAYOUT OF DIESEL POWER PLANT Explanation	4+5	9
2(a)	It is the method of burning coal in powder form. In this method , coal is reduced to a fine particle such that 70 to 80% Passes a 200 mesh sieve. Powder form coal has more surface exposer thus , permitting rapid combustion Coal Burners Tangential Burner Cyclone Burner 	1+3+2	6
(c)	To avoid deterioration or burning of lubricating oil. • The strength of the materials used for various engine parts decreases with increase in temperature. Local thermal stress can develop uneven expansion of various parts. • Increase pre ignition and knocking. • Due to high cylinder head temperature . the volumetric efficiency and hence power output of engine are reduced. Thermo syphon cooling system: 	3+4+2	9
3(a)		2+2	4

(b)	Spreader Stoker  .Any four advantage and disadvantages	2+1+2	5
(c)	ADVANTAGES AND DISADVANTAGES OF DIESEL POWER PLANT ADVANTAGES->: - Simple design & layout of plant - Occupies less space & is compact - Can be started quickly and picks up load in a short time - Requires less water for cooling - Thermal efficiency better than of Steam Power Plant of same size - No ash handling problem - Less operating and supervising work is required DISADVANTAGES->: - High running charges due to costly price of Diesel - Generates small amount of power - Cost of lubrication very high - Maintenance charges are generally high - Noise problem - Capacity is restricted. Cannot be of very big size applications	4+2	6
4(a)	Benson Boiler 	2+2	4
(b)	Starting of engine can done by employing the fallowing methods: By a compressed air system By an electric motor By an auxiliary engine Explanation each method	2+3	5
(c)	$P_1 = P_a + \rho_g.gH$ - 1 $P_2 = P_a + \rho_a.gH$ - 1 $\triangle P = P_2 - P_1 = (\rho_a - \rho_g)\, gH$ - 1 $P = \rho g h$ - - - - - (1) $\rho_o = \frac{P}{RT_o}, \quad \rho_a = \frac{P}{RT_a}, \quad \rho_g = \frac{P}{RT_g}$ - 1 $\Delta p = P_a - P_g = \frac{\rho_o T_o}{T_a} gh - \frac{m+1}{m} \times \frac{\rho_o T_o}{T_g} gh = \rho_o T_o gh \left[\frac{1}{T_a} - \frac{m+1}{mT_g} \right]$ - 1 $h = 353\, H \left(\frac{1}{T_a} - \frac{m+1}{mTg} \right)$ - 1		6

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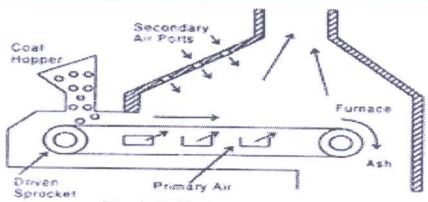
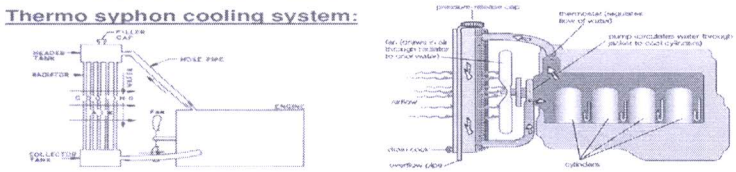
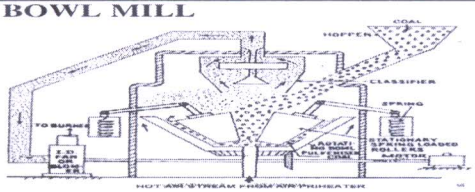
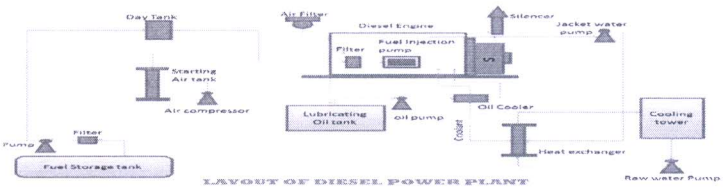
I CIE TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

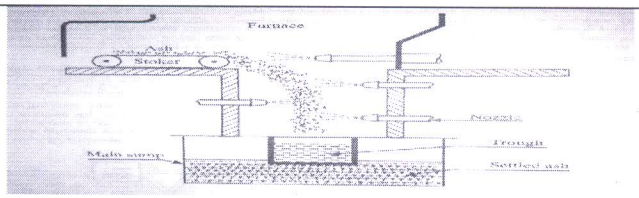
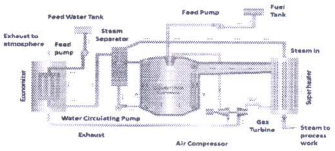
SCHEME OF EVALUATION

SET – B

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**ENERGY ENGG**	**Date**	:	**23-09-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	POINTS	Marks Split	Total Marks
1(a)	 Fig. 2-4. Chain grate stoker Explanation	3+3	6
(b)	To avoid deterioration or burning of lubricating oil. • The strength of the materials used for various engine parts decreases with increase in temperature. Local thermal stress can develop uneven expansion of various parts. • Increase pre ignition and knocking. • Due to high cylinder head temperature . the volumetric efficiency and hence power output of engine are reduced. Thermo syphon cooling system: 	4+5	9
2(a)	BOWL MILL  Explanation	4+2	6
(b)	 LAYOUT OF DIESEL POWER PLANT Explanation	3+6	9

3(a)	 Explanation	2+2	4
(b)	Starting of engine can done by employing the fallowing methods: By a compressed air system By an electric motor By an auxiliary engine Explanation each method.	2+1+2	5
(c)	$P_1v_1/T_1 = P_1v_1/T_1$ $P_a/\rho_aT_a = P_{NTP}/\rho_{NTP}T_{NTP}$ $\rho_aT_a = \rho_{NTP}T_{NTP}$ $\rho_a = 1.1845\ kg/m^3$ $\rho_gT_g = \rho_{NTP}T_{NTP}$ $\rho_g = 0.686\ kg/m^3$ $hw = gH(\rho_a - \rho)$ H=36.1m	1+1+1+ 1+1+1	6
4(a)	 **Velox Boiler** Explanation	2+2	4
(b)	**Natural draught** **Forced draught** **Induced draught** **Balanced draught** Explanation	2+3	5
(c)	ADVANTAGES AND DISADVANTAGES OF DIESEL POWER PLANT ADVANTAGES :- - Simple design & layout of plant - Occupies less space & is compact - Can be started quickly and picks up load in a short time - Requires less water for cooling - Thermal efficiency better that of Steam Power Plant of same size - No coal handling problem - Less operating and supervising work is required DISADVANTAGES :- - High running charges due to costly price of Diesel - Generates small amount of power - Cost of lubrication very high - Maintenance charges are generally high - Noise problem - Capacity is restricted. - Cannot be of very big size applications		6

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I A Marks

SL.NO	REG. NO.	STUDENT NAMES	I IA
1	1KS16ME057	PAVITHRA.B	A
2	1KS16ME081	SHIVARAJ.N.S	15
3	1KS16ME082	SHIVASHANKAR.B.M	15
4	1KS16ME083	SIRISH GOVARDHAN	15
5	1KS16ME084	SOWJANYA.D	10
6	1KS16ME085	SREEKARA.K.B	15
7	1KS16ME086	SUDARSHAN.T	11
8	1KS16ME087	SUDHARSHAN.M.D	4
9	1KS16ME089	SUMESH.R	15
10	1KS16ME090	SUPREETH.K.R	A
11	1KS16ME093	VARUN.C	A
12	1KS16ME094	VASANTH KUMAR.S	13
13	1KS16ME095	VIJAYA KUMAR.M.S	13
14	1KS16ME096	VIJAYKUMARNAIK.T.C	A
15	1KS16ME097	VINAY.B.V	A
16	1KS16ME098	VINAY.V.P	A
17	1KS16ME099	VINITH.P	12
18	1KS16ME100	VITHAN.T.R	13
19	1KS16ME101	ABHIJITH.C	13
20	1KS16ME102	MADHU.G.K	10
21	1KS16ME105	RAKESH.B.R	A

22	1KS16ME106	MOHAMMED ZUFIKAR	13
23	1KS16ME107	SAGAR C	13
24	1KS17ME401	ARUNKUMAR.E	A
25	1KS17ME402	ARUN KUMAR.R	13
26	1KS17ME404	CHETHAN.C.R	A
27	1KS17ME405	DARSHAN.H.R	2
28	1KS17ME406	DEEPAK.E	A
29	1KS17ME408	GUHAN BHASKAR	10
30	1KS17ME409	GURUPRASAD.T.M	13
31	1KS17ME410	GURUSWAMY.H	13
32	1KS17ME411	JEEVAN ABHISHEK	A
33	1KS17ME412	KANTHARAJU.K.N	A
34	1KS17ME413	KIRAN.S	A
35	1KS17ME415	LOHITH.R	13
36	1KS17ME416	MAHADEVA RAJU.H.E	9
37	1KS17ME417	MAHESH.D	A
38	1KS17ME418	MANISH.N.D	A
39	1KS17ME419	MITHUN.S	9
40	1KS17ME420	MOHAN KUMAR.C	A
41	1KS17ME421	MOHAN KUMAR.K	15
42	1KS17ME422	NAGESH.S	11
43	1KS17ME423	NIKHIL GOWDA.N.S	3
44	1KS17ME425	PRATAP.L	11
45	1KS17ME426	PRATHEEK.P	A
46	1KS17ME430	RAKESH.B.R	A
47	1KS17ME431	RAKSHITH.L	15
48	1KS17ME432	RAVI.K.R	10

49	1KS17ME434	SHASHANK.Y.K	A
50	1KS17ME435	SHASHIKUMAR.C.R	A
51	1KS17ME437	SRINIVASA.B.V	10
52	1KS17ME439	SURABHI.N	14
53	1KS17ME440	SUSHMA.Y.S	13
54	1KS17ME441	TEJAS.P.N	14
55	1KS17ME442	THRIVENI.M	A
56	1KS17ME444	VINAY.S	15

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KSIT Bangalore

DEPARTMENT OF MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Academic Year	**2019-2020**		
Batch	**2016**		
Year/Semester/section	**IV/VII/A&B**		
Subject Code-Title	**15ME71**		
Name of the Instructor	**Prasad k**	**Dept**	**ME**

Assignment No: 2 **Total marks: 20**

Date of Issue: 17/10/19 **Date of Submission: 28/10/19**

Sl.No	Assignment Questions	K Level	CO	Marks
1.	**Give** the advantages and disadvantages of solar Energy.	K2	CO2	2
2.	**Distinguish** between Pyrheliometer and Pyranomete	K2	CO2	2
3.	Briefly **explain** the working principle of solar cell and discuss the parameter affecting the performance	K2	CO2	2
4.	**Define** The terms: i) Solar constant ii) Direct radiation iii) diffused radiation iv) Extra terrestrial radiation	K2	CO2	2
5.	**Sketch** & explain the principle of working of solar pond.	K3	CO4	2
6.	**Classify** solar radiation measuring instruments. Explain any one of instrument with sketch	K3	CO4	2
7.	**Determine** the local solar time and declination at a location latitude **23°15'** N ,longitude **77°30'** E at 12:30 IST on June 19 . Equation of time correction is given from standard chart = -(1 '01 ")	K3	CO4	2
8.	**Calculate** the angle made by radiation with the normal to flat plate collector on May 10 at 0900h(local apparent time).The collector is located in New Delhi (**28°35' N,77°12' E**).It is tilted at an angle of 36^0 with the horizontal and is point down south	K3	CO4	2
9.	The run-off data of 2 rivers for 12 months is tabulated below .Run-off is given in million of m^3/month. Month | Jan | Feb | March | April | May | June | July | Au River-A | 40 | 30 | 20 | 15 | 10 | 80 | 140 | 12(River-B | 50 | 50 | 40 | 40 | 40 | 90 | 100 | 10(Using the above data **Find** i) Ratio of run- off of two rivers, if runoff is constant for 40% time of the year. ii) If constant run off is 80% time of total year, then which river site is more preferable for run-off plant and why.iii) Which site is more preferable for storage type plant and why.	K3	CO3	2

10.	The run off data of a river at a particular site is tabulated above i) **Find** the power in MW available at mean flow, if the head available is 90 m and overall efficiency of generation is 86%.Take each month of 30 days ii)Draw a hydrograph and find the mean flow. iii)Draw the flow duration curve	**K3**	**CO3**	2

Month	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Mean discharge per month(millions of Cu.m)	40	25	20	10	0	50	75	100	110	60	50	40

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II SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –A **SCHEME OF EVALUATION**

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**Energy Engg**	**Date**	:	**21-10-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks Split s	Total Marks
1(a)	Each Sketch Explanation	2+2+3 +3	10
(b)	$\cos\theta_T=\cos(\phi-s)\cos\delta\cos\omega+\sin(\phi-s)\sin\delta$ Declinationangle(δ)=23.45sin(360365)(284+n) declination angle is -22.11 $\omega=15*(12-LST)$ hour anlge is 45 Angle made by the beam radiation to a flat collector on 335 day at 9:00AM is %02.05s deg	1+1+1 +1+1	5
2(a)	Each Sketch Explanation	2+2+3 +3	10
(b)	LST=IST−[4*(STL−LOL)]+C Local Solar Time : 12hrs :08mins :59secs Declinationangle(δ)=23.45sin(360365)(284+n)= 23.445	1+2+2	5
3(a)	Classification Sketch Explanation	1+2+2	5

(b)	Average flow A =58.78millions of m^3/month Average flow B =64.20millions of m^3/month Hydrograph the flow duration Run-off rate of the rivers is same at 25%	1+1+1 +1+1	5
(c)	Classification Sketch Explanation	1+2+2	5
4(a)	Each definition	1+1+1 +1+1	5
(b)	Average flow =4.83millions of m^3/month Hydrograph the flow duration $P= wQH \eta_{o}/1000$ P= 89MW		5
(c)	Sketch Explanation	2+3	5

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II SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –B

USN | | | | | | | | | | |

Degree : **B.E** | **Semester** : **VII**
Branch : **Mechanical Engineering** | **Course Code** : **15ME71**
Course Title : **Energy Engg** | **Date** : **21-10-2019**
Duration : **90 Minutes** | **Max Marks** : **30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks	CO mapping	K-Level
	PART-A			
1(a)	i) **Discuss** the following terms a) Solar constant b) Direct radiation c) Diffusion radiation d) Extra terrestrial radiation ii) With neat **Sketch** and explain the Flat plate collector	**10**	**CO2**	**Understanding**
(b)	**Determine** the local solar time and declination at a location latitude **23°15'** N ,longitude **77°30'** E at 12:30 IST on June 19 . Equation of time correction is given from standard chart = **-(1 '01 ")**	**5**	**CO4**	**Applying**
	OR			
2(a)	**Explain** with the help of neat sketch a solar dryer and solar refrigeration	**10**	**CO2**	**Understanding**
(b)	**Calculate** the angle made by radiation with the normal to flat plate collector on May 10 at 0900h(local apparent time).The collector is located in New Delhi (**28°35' N,77°12' E**).It is tilted at an angle of 36^0 with the horizontal and is point down south.	**5**	**CO4**	**Applying**

	PART-B				
3(a)	**Explain** the following terms related to hydro electric power plant i) Pen stock ii) water hammer iii) Surge tank	**5**	**CO1**	**Understanding**
(b)	<table><tr><td>Month</td><td>Jan</td><td>Feb</td><td>March</td><td>April</td><td>May</td><td>June</td><td>July</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr><tr><td>Mean discharge per month(millions of Cu.m)</td><td>40</td><td>25</td><td>20</td><td>10</td><td>0</td><td>50</td><td>75</td><td>100</td><td>110</td><td>60</td><td>50</td><td>40</td></tr></table> The run off data of a river at a particular site is tabulated above i) **Find** the power in MW available at mean flow, if the head available is 90 m and overall efficiency of generation is 86%.Take each month of 30 days ii)Draw a hydrograph and find the mean flow. iii)Draw the flow duration curve.	**5**	**CO3**	**Applying**
(c)	**Explain** with the help of neat sketch a solar pond	**5**	**CO4**	**Applying**

OR

4(a)	How are the Hydro-electric power plant **Classified** .With a neat **Sketch** Explain the pumped storage plant.	5	CO1	Understanding
(b)	The run-off data of 2 rivers for 12 months is tabulated below .Run-off is given in million of m^3/month. Using the above data **Find** i) Ratio of run- off of two rivers, if runoff is constant for 40% time of the year. ii) If constant run off is 80% time of total year, then which river site is more preferable for run-off plant and why.iii) Which site is more preferable for storage type plant and why.	5	CO3	Applying
(c)	**Explain** the principle PV conversion.	5	CO4	Applying

Month	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
River-A	40	30	20	15	10	80	140	120	100	60	50	40
River-B	50	50	40	40	40	90	100	100	80	70	60	70

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Bengaluru - 560 109.

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II SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SCHEME OF EVALUATION

SET –A

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**Energy Engg**	**Date**	:	**21-10-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks Split	Total Marks
1(a)	Sketch Explanation	2+2+3+3	10
(b)	$\cos\theta_T=\cos(\phi-s)\cos\delta\cos\omega+\sin(\phi-s)\sin\delta$ $\text{Declinationangle}(\delta)=23.45\sin(360365)(284+n)$ declination angle is -22.11 $\omega=15*(12-LST)$ hour anlge is 45 Angle made by the beam radiation to a flat collector on 335 day at 9:00AM is %02.05s deg	1+2+2	5
2(a)	Each Sketch Explanation	2+2+3 +3	10
(b)	LST=IST−[4*(STL−LOL)]+C Local Solar Time : 12hrs :08mins :59secs $\text{Declinationangle}(\delta)=23.45\sin(360365)(284+n)=$ 23.445	1+1+1 +1+1	5
3(a)	Classification Sketch	1+2+2	5

	Explanation		
(b)	Average flow A =58.78millions of m^3/month Average flow B =64.20millions of m^3/month Hydrograph the flow duration	1+1+1 +1+1	5
(c)	Classification Sketch Explanation	2+3	5
4(a)	Classification function of draft tube	2+3	5
(b)	. Run-off rate of the rivers is same at 25%Average flow =4.83millions of m^3/month Hydrograph the flow duration P= wQH η_{o} /1000 P= 89MW	1+1+1 +1+1	**5**
(c)	I Each Definition	**1+1+1 +1+1**	**5**

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K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109
II SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER
SCHEME OF EVALUATION

SET –B

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**Energy Engg**	**Date**	:	**21-10-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks Split	Total Marks
1(a)	I Each Definition ii) Sketch Explanation	1+1+1 +1+1 2+3	10
(b)	LST=IST−[4∗(STL−LOL)]+C Local Solar Time : 12hrs :08mins :59secs Declinationangle(δ)=23.45sin(360365)(284+n)= 23.445	1+2+2	5
2(a)	Each Sketch Explanation	2+2+3 +3	10
(b)	$\cos\theta_T=\cos(\phi-s)\cos\delta\cos\omega+\sin(\phi-s)\sin\delta$ Declinationangle(δ)=23.45sin(360365)(284+n) declination angle is -22.11 $\omega=15*(12-LST)$ hour anlge is 45 Angle made by the beam radiation to a flat collector on 335 day at 9:00AM is %02.05s deg	1+1+1 +1+1	5
3(a)	1st term 2nd and 3rd term	1+2+2	5

(b)	Average flow =4.83millions of m^3/month Hydrograph the flow duration $P= wQH \eta_{o/1000}$ P= 89MW	1+1+1 +1+1	5
(c)	Each Sketch Explanation	2+3	5
4(a)	Classification Sketch Explanation	1+2+2	5
(b)	. Average flow A =58.78millions of m^3/month Average flow B =64.20millions of m^3/month Hydrograph the flow duration Run-off rate of the rivers is same at 25%	1+1+1 +1+1	**5**
(c)	Sketch Explanation	**2+3**	**5**

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I A Marks

SL.NO	REG. NO.	STUDENT NAMES	II IA
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20	1KS16ME102	MADHU.G.K	14
21	1KS16ME105	RAKESH.B.R	13

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31	1KS17ME410	GURUSWAMY.H	11
32	1KS17ME411	JEEVAN ABHISHEK	14
33	1KS17ME412	KANTHARAJU.K.N	10
34	1KS17ME413	KIRAN.S	8
35	1KS17ME415	LOHITH.R	10
36	1KS17ME416	MAHADEVA RAJU.H.E	10
37	1KS17ME417	MAHESH.D	13
38	1KS17ME418	MANISH.N.D	12
39	1KS17ME419	MITHUN.S	A
40	1KS17ME420	MOHAN KUMAR.C	9
41	1KS17ME421	MOHAN KUMAR.K	11
42	1KS17ME422	NAGESH.S	12
43	1KS17ME423	NIKHIL GOWDA.N.S	12
44	1KS17ME425	PRATAP.L	8
45	1KS17ME426	PRATHEEK.P	7
46	1KS17ME430	RAKESH.B.R	A
47	1KS17ME431	RAKSHITH.L	12
48	1KS17ME432	RAVI.K.R	A

49	1KS17ME434	SHASHANK.Y.K	13
50	1KS17ME435	SHASHIKUMAR.C.R	13
51	1KS17ME437	SRINIVASA.B.V	9
52	1KS17ME439	SURABHI.N	12
53	1KS17ME440	SUSHMA.Y.S	15
54	1KS17ME441	TEJAS.P.N	14
55	1KS17ME442	THRIVENI.M	15
56	1KS17ME444	VINAY.S	12

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KSIT

KSIT Bangalore

DEPARTMENT OF MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Academic Year	**2019-2020**		
Batch	**2016**		
Year/Semester/section	**IV/VII/A&B**		
Subject Code-Title	**15ME71**		
Name of the Instructor	**Prasad k**	**Dept**	**ME**

Assignment No: 3 **Total marks: 20**

Date of Issue: 15/11/19 **Date of Submission: 22/11/19**

Sl.No	Assignment Questions	K Level	CO	Marks
1.	With neat sketch **explain** the fallowing: I) single basin tidal plant ii) double basin tidal plant	**K2**	**CO2**	2
2.	Write advantages and disadvantages of tidal power plant	**K2**	**CO2**	2
3.	Wind at 1 standard atmospheric pressure and 20^0C has velocity of 12 m/s. The turbine has diameter of 120 m and operating speed in 40 rpm at maximum efficiency. **Calculate** i) Total power density ii) Maximum power density iii) Obtainable power density assuming η =35% iv) Total power v) Total torque	**K3**	**CO4**	2
4.	**Prove that** in case of horizontal axis wind turbine maximum power P_{max} =8/27 (ρAV^3)	**K3**	**CO4**	2
5.	With neat sketch **explain** the i) Fixed dome type biogas plant ii) Floating drum type biogas plant	**K3**	**CO5**	2
6.	How gasifiers are **classified**? With neat sketch explain the working of down draught gasifier.	**K3**	**CO5**	2
7.	What are factors affecting biogas generation? explain briefly	**K3**	**CO5**	2
8.	**Explain** the nuclear reactor with neat sketch.	**K3**	**CO5**	2
9.	**Explain** with neat sketch Rankine cycle OTEC plant	**K3**	**CO5**	2
10.	With neat sketch **explain** the principle of harnessing the energy from geothermal plant	**K3**	**CO5**	2

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K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109

III SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –A

USN | | | | | | | | | | |

Degree	:	**B.E**	**Semester**	: **VII**
Branch	:	**Mechanical Engineering**	**Course Code**	: **15ME71**
Course Title	:	**Energy Engg**	**Date**	: **25-10-2019**
Duration	:	**90 Minutes**	**Max Marks**	: **30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks	CO mapping	K-Level
	PART-A			
1(a)	With a neat sketch , **Explain** the working of updraft gasifier. Mention the temperature range	10	CO2	Understanding
(b)	**Identify** different types of biogas plants and Explain Indian type biogas plant with neat sketch.	5	CO5	Applying
	OR			
2(a)	**Explain** with neat sketch i) Vertical axis type wind mill ii) Horizontal axis wind mill	10	CO2	Understanding
(b)	**Identify** the gasifiers based on flow direction of biomass with gas and with a schematic diagram explain the working of downdraft gasifier	5	CO 5	Applying
	PART-B			
3(a)	Wind at 1 standard atmospheric pressure and 20^0C has velocity of 12 m/s. The turbine has diameter of 120 m and operating speed in 40 rpm at maximum efficiency. **Calculate** i) Total power density ii) Maximum power density iii) Obtainable power density assuming η =35% iv) Total power v) Total torque	10	CO4	Applying
(b)	**Identify** the factors affecting biogas production	5	CO5	Applying
	OR			
4(a)	**Prove that** in case of horizontal axis wind turbine maximum power P_{max} =8/27 ($\rho A V^3$)	10	CO4	Applying
(b)	**Identify** the need of Energy plantation and discuss its advantages and disadvantages	5	CO5	Applying

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III SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –B

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**Energy Engg**	**Date**	:	**25-11-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks	Total Marks
1(a)	**Explain** single basin and double basin arrangement of tidal power plant	10	CO2
(b)	**Identify** different types of biogas plants and Explain Indian type biogas plant with neat sketch.	5	CO5
2(a)	**write short notes** on i) Anaerobic fermentation ii) Photosynthesis	10	CO2
(b)	**Identify** the gasifiers based on flow direction of biomass with gas and with a schematic diagram explain the working of updraft gasifier	5	CO 5
3(a)	**Prove that in case of horizontal axis wind turbine maximum power Pmax =8/27 (ρAV3)**	10	CO4
(b)	**Identify the need of Energy plantation and discuss its advantages and disadvantages**	5	CO5
4(a)	**Wind at 1 standard atmospheric pressure and 200C has velocity of 12 m/s. The turbine has diameter of 120m and operating speed in 40 rpm at maximum efficiency. Calculate i) Total power density ii) Maximum power density iii) Obtainable power density assuming η =35% iv) Total power v) Total torque**	10	CO4
(b)	**Identify the factors affecting biogas production**	5	CO5

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III SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –A

Degree	:	**B.E**	**Semester**	:	**VII**
Branch	:	**Mechanical Engineering**	**Course Code**	:	**15ME71**
Course Title	:	**Energy Engg**	**Date**	:	**21-10-2019**
Duration	:	**90 Minutes**	**Max Marks**	:	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks Split	Total Marks
1(a)	Sketch Explanation	5+5	10
(b)	Types of biogas plants Sketch Explanation	1+2+2	5
2(a)	Sketch each Explanation	2+2+3+3	10
(b)	Types of gasifiers Sketch Explanation	1+2+2	5
3(a)	i.613 W/m2, ii 363 W/m2, iii 245 Wh, iv 2770 kW v347 N, , vi 255 N	2+2+2+2+2	10
(b)	Any five factors	1+1+1+1+1	5
4(a)	$F=1/2\rho S.V^2_1(1-b^2)F=1/2\rho S.V_12(1-b^2)$ $P=1/4\rho S(V^2_1-V_2^2)(V_1+V_2)=1/4\ \rho S_1V^3\ (1-b^2)(1+b)$ $P'=PS=_{12}\rho SV_3S=12\rho V_3$ $W=1/2\rho SV^3$ $dC_p/db=1/2\ d/db[(1-b^2)(1+b)]$ $b=V_2/V_1=/13,\Rightarrow V2=1/3V1$	1+1+1+1+1+1+1+1+1+1	10

	$P_{max} == 8/27\ \rho S_1 V^3$		
(b)	Any five advantages and disadvantages	1+1+1+1+1	5

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III SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET –B **SCHEME OF EVALUATION**

Degree	:	**B.E**	**Semester** :	**VII**
Branch	:	**Mechanical Engineering**	**Course Code** :	**15ME71**
Course Title	:	**Energy Engg**	**Date** :	**21-10-2019**
Duration	:	**90 Minutes**	**Max Marks** :	**30**

Note: Answer ONE full question from each part.

Q No.	Question	Marks Split	Total Marks
1(a)	Sketch Explanation	5+5	10
(b)	Types of biogas plants Sketch Explanation	1+2+2	5
2(a)	Sketch each Explanation	2+2+3+3	10
(b)	Types of gasifiers Sketch Explanation	1+2+2	5
3(a)	$F=1/2\rho S.V^2_1(1-b^2)F=1/2\rho S.V_12(1-b^2)$ $P=1/4\rho S(V^2_1-V_2^2)(V_1+V_2)=1/4\ \rho S_1V^3\ (1-b^2)(1+b)$ $P'=PS=_{12}\rho SV_3S=12\rho V_3$ $W=1/2\rho SV^3$ $dC_p/db=1/2\ d/db[(1-b^2)(1+b)]$ $b=V_2/V_1=/13,\Rightarrow V2=1/3V_1$ $P_{max}==8/27\ \rho S_1V^3$	1+1+1+1+1+1+ 1+1+1+1+	10
(b)	Need of Energy plantation Any four advantages and disadvantages	1+2+2	5
4(a)	i.613 W/m2, ii 363 W/m2, iii 245 Wh, iv 2770 kW	2+2+2+2+2	10

	v347 N, , vi 255 N		
(b)	Any five factors	1+1+1+1+1	**5**

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I A Marks

SL.NO	REG. NO.	STUDENT NAMES	III IA
1	1KS16ME057	PAVITHRA.B	15
2	1KS16ME081	SHIVARAJ.N.S	A
3	1KS16ME082	SHIVASHANKAR.B.M	A
4	1KS16ME083	SIRISH GOVARDHAN	15
5	1KS16ME084	SOWJANYA.D	15
6	1KS16ME085	SREEKARA.K.B	15
7	1KS16ME086	SUDARSHAN.T	14
8	1KS16ME087	SUDHARSHAN.M.D	15
9	1KS16ME089	SUMESH.R	15
10	1KS16ME090	SUPREETH.K.R	15
11	1KS16ME093	VARUN.C	15
12	1KS16ME094	VASANTH KUMAR.S	A
13	1KS16ME095	VIJAYA KUMAR.M.S	13
14	1KS16ME096	VIJAYKUMARNAIK.T.C	15
15	1KS16ME097	VINAY.B.V	15
16	1KS16ME098	VINAY.V.P	11
17	1KS16ME099	VINITH.P	A
18	1KS16ME100	VITHAN.T.R	10
19	1KS16ME101	ABHIJITH.C	15
20	1KS16ME102	MADHU.G.K	A
21	1KS16ME105	RAKESH.B.R	15

22	1KS16ME106	MOHAMMED ZUFIKAR	A
23	1KS16ME107	SAGAR C	A
24	1KS17ME401	ARUNKUMAR.E	13
25	1KS17ME402	ARUN KUMAR.R	
26	1KS17ME404	CHETHAN.C.R	15
27	1KS17ME405	DARSHAN.H.R	15
28	1KS17ME406	DEEPAK.E	15
29	1KS17ME408	GUHAN BHASKAR	A
30	1KS17ME409	GURUPRASAD.T.M	15
31	1KS17ME410	GURUSWAMY.H	A
32	1KS17ME411	JEEVAN ABHISHEK	15
33	1KS17ME412	KANTHARAJU.K.N	15
34	1KS17ME413	KIRAN.S	13
35	1KS17ME415	LOHITH.R	15
36	1KS17ME416	MAHADEVA RAJU.H.E	15
37	1KS17ME417	MAHESH.D	15
38	1KS17ME418	MANISH.N.D	15
39	1KS17ME419	MITHUN.S	15
40	1KS17ME420	MOHAN KUMAR.C	15
41	1KS17ME421	MOHAN KUMAR.K	A
42	1KS17ME422	NAGESH.S	14
43	1KS17ME423	NIKHIL GOWDA.N.S	13
44	1KS17ME425	PRATAP.L	15
45	1KS17ME426	PRATHEEK.P	15
46	1KS17ME430	RAKESH.B.R	15
47	1KS17ME431	RAKSHITH.L	14
48	1KS17ME432	RAVI.K.R	15

49	1KS17ME434	SHASHANK.Y.K	15
50	1KS17ME435	SHASHIKUMAR.C.R	15
51	1KS17ME437	SRINIVASA.B.V	15
52	1KS17ME439	SURABHI.N	A
53	1KS17ME440	SUSHMA.Y.S	A
54	1KS17ME441	TEJAS.P.N	A
55	1KS17ME442	THRIVENI.M	12
56	1KS17ME444	VINAY.S	A

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I A Marks

SL.NO	REG. NO.	STUDENT NAMES	I IA	II IA	III IA	Final IA
1	1KS16ME057	PAVITHRA.B	A	10	15	18
2	1KS16ME081	SHIVARAJ.N.S	15	14	A	20
3	1KS16ME082	SHIVASHANKAR.B.M	15	15	A	20
4	1KS16ME083	SIRISH GOVARDHAN	15	A	15	20
5	1KS16ME084	SOWJANYA.D	10	11	15	18
6	1KS16ME085	SREEKARA.K.B	15	A	15	20
7	1KS16ME086	SUDARSHAN.T	11	8	14	18
8	1KS16ME087	SUDHARSHAN.M.D	4	12	15	19
9	1KS16ME089	SUMESH.R	15	A	15	20
10	1KS16ME090	SUPREETH.K.R	A	13	15	19
11	1KS16ME093	VARUN.C	A	12	15	19
12	1KS16ME094	VASANTH KUMAR.S	13	14	A	19
13	1KS16ME095	VIJAYA KUMAR.M.S	13	8	13	18
14	1KS16ME096	VIJAYKUMARNAIK.T.C	A	15	15	20
15	1KS16ME097	VINAY.B.V	A	12	15	19
16	1KS16ME098	VINAY.V.P	A	10	11	16
17	1KS16ME099	VINITH.P	12	9	A	16
18	1KS16ME100	VITHAN.T.R	13	A	10	17
19	1KS16ME101	ABHIJITH.C	13	A	15	19
20	1KS16ME102	MADHU.G.K	10	14	A	17
21	1KS16ME105	RAKESH.B.R	A	13	15	19

22	1KS16ME106	MOHAMMED ZUFIKAR	13	13	A	18
23	1KS16ME107	SAGAR C	13	10	A	17
24	1KS17ME401	ARUNKUMAR.E	A	9	13	16
25	1KS17ME402	ARUN KUMAR.R	13	9		16
26	1KS17ME404	CHETHAN.C.R	A	10	15	18
27	1KS17ME405	DARSHAN.H.R	2	11	15	18
28	1KS17ME406	DEEPAK.E	A	13	15	19
29	1KS17ME408	GUHAN BHASKAR	10	9	A	15
30	1KS17ME409	GURUPRASAD.T.M	13	9	15	19
31	1KS17ME410	GURUSWAMY.H	13	11	A	17
32	1KS17ME411	JEEVAN ABHISHEK	A	14	15	20
33	1KS17ME412	KANTHARAJU.K.N	A	10	15	18
34	1KS17ME413	KIRAN.S	A	8	13	16
35	1KS17ME415	LOHITH.R	13	10	15	19
36	1KS17ME416	MAHADEVA RAJU.H.E	9	10	15	18
37	1KS17ME417	MAHESH.D	A	13	15	19
38	1KS17ME418	MANISH.N.D	A	12	15	19
39	1KS17ME419	MITHUN.S	9	A	15	17
40	1KS17ME420	MOHAN KUMAR.C	A	9	15	17
41	1KS17ME421	MOHAN KUMAR.K	15	11	A	18
42	1KS17ME422	NAGESH.S	11	12	14	17
43	1KS17ME423	NIKHIL GOWDA.N.S	3	12	13	18
44	1KS17ME425	PRATAP.L	11	8	15	17
45	1KS17ME426	PRATHEEK.P	A	7	15	16
46	1KS17ME430	RAKESH.B.R	A	A	15	13
47	1KS17ME431	RAKSHITH.L	15	12	14	20
48	1KS17ME432	RAVI.K.R	10	A	15	17

49	1KS17ME434	SHASHANK.Y.K	A	13	15	19
50	1KS17ME435	SHASHIKUMAR.C.R	A	13	15	19
51	1KS17ME437	SRINIVASA.B.V	10	9	15	18
52	1KS17ME439	SURABHI.N	14	12	A	18
53	1KS17ME440	SUSHMA.Y.S	13	15	A	19
54	1KS17ME441	TEJAS.P.N	14	14	A	19
55	1KS17ME442	THRIVENI.M	A	15	12	19
56	1KS17ME444	VINAY.S	15	12	A	19

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DEPARTMENT OF MECHANICAL ENGINEERING

YEAR / SEMESTER	IV/ VII
COURSE TITLE	ENERGY ENGINEERING
COURSE CODE	15ME71
ACADEMIC YEAR	2019-2020

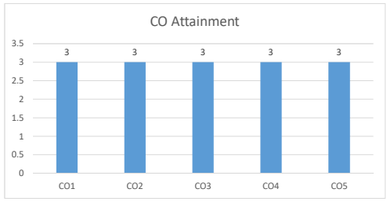
CO Attainment Level	Significance
Level 3	60% and above students should have scored >= 60% of Total marks
Level 2	55% to 59% of students should have scored >= 60% of Total marks
Level 1	50% to 54% of students should have scored >= 60% of Total marks

For Direct attainment , 50% of CIE and 50% of SEE marks are considered.
For indirect attainment, Course end survey is considered.
CO attainment is 90%of direct attainment + 10% of Indirect atttainment.
PO attainment = CO-PO mapping strength/3 * CO attainment .

Sl. No	USN	Name of the Student	15ME71																											SEE
			1A1					A1					1A2					A2					1A3					A3				
			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	
			15		15			12		8			5	10	5	10			**8**	**4**	8			10		10	10		4		4	12	**80**
1	1KS16ME002	ABHIJEETH.B.BHAT	12		13			12		8			2	9	5	10			8	4	8			0		0	0		4		4	12	47
2	1KS16ME004	ABHILASH.S	12		10			12		8			5	9	5	5			8	4	8			0		0	0		4		4	12	57
3	1KS16ME006	ABHISHEK PAREEK	12		13			12		8			4	9	5	2			8	4	8			14		11	0		4		4	12	58
4	1KS16ME008	AMOGHA.M.KEKUDA	8		13			12		8			5	9	5	9			8	4	8			0		0	0		4		4	12	66
5	1KS16ME009	ASHOK KUMAR KARMALI	10		14			12		8			5	3	4	8			8	4	8			0		0	0		4		4	12	58
6	1KS16ME010	ASHWIN MAIYA.M	9		12			12		8			5	9	4	3			8	4	8			0		0	0		4		4	12	42
7	1KS16ME011	BHARATHKUMAR.P	7		12			12		8			5	8	5	7			8	4	8			15		14	0		4		4	12	50
8	1KS16ME012	BHARGAV JOSHI	0		0			12		8			4	8	4	3			8	4	8			13		14	0		4		4	12	60
9	1KS16ME013	BHUVAN BHARADWAJ.V.K	6		14			12		8			5	7	5	3			8	4	8			12		12	0		4		4	12	63
10	1KS16ME014	CHANDAN KUMAR.N.P	11		12			12		8			4	7	5	8			8	4	8			15		13	0		4		4	12	45
11	1KS16ME015	CHIRAG.B.P	11		12			12		8			5	7	5	4			8	4	8			14		14	0		4		4	12	57
12	1KS16ME016	DEEPAK.R.GOWDA	11		12			12		8			5	8	5	6			8	4	8			0		0	0		4		4	12	63
13	1KS16ME019	HARISH HADIMANI	12		15			12		8			5	8	5	9			8	4	8			0		0	0		4		4	12	60
14	1KS16ME021	HARSHA.S	6		13			12		8			0	0	0	0			8	4	8			14		13	0		4		4	12	65
15	1KS16ME022	HARSHAVARDHAN.N	10		14			12		8			0	0	0	0			8	4	8			13		15	0		4		4	12	64
16	1KS16ME023	HARSHITH.S	8		8			12		8			4	4	5	7			8	4	8			0		0	0		4		4	12	57
17	1KS16ME024	HEMANTH.R	8		11			12		8			0	0	0	0			8	4	8			12		11	0		4		4	12	50
18	1KS16ME025	HEMANTH KUMAR.D.L	9		9			12		8			2	8	5	6			8	4	8			8		10	0		4		4	12	
19	1KS16ME026	HITESH.C.S	12		13			12		8			5	8	5	8			8	4	8			0		0	0		4		4	12	61
20	1KS16ME027	IMRAN KHAN	0		0			12		8			4	3	5	5			8	4	8			12		14	0		4		4	12	51
21	1KS16ME028	IRANNA CHANABASAPPA TELI	12		4			12		8			5	8	5	1			8	4	8			13		11	0		4		4	12	
22	1KS16ME029	JAGADISH.P.SHETTI	12		7			12		8			4	9	5	5			8	4	8			12		12	0		4		4	12	56
23	1KS16ME030	JAYANTH.P	8		7			12		8			4	9	3	4			8	4	8			13		10	0		4		4	12	44
24	1KS16ME031	JAYDEEP.B	9		11			12		8			4	8	5	4			8	4	8			0		0	0		4		4	12	48
25	1KS16ME032	JUNAID KHAN	0		0			12		8			2	0	2	4			8	4	8			14		12	0		4		4	12	47
26	1KS16ME033	KANISHKA.P.SHANKAR	4		14			12		8			5	9	5	4			8	4	8			13		13	0		4		4	12	55
27	1KS16ME035	KAUSHIK.K.H	3		3			12		8			0	2	0	2			8	4	8			11		11	0		4		4	12	34
28	1KS16ME036	KIRAN PRAKASH AKOLKAR	0		0			12		8			4	4	5	8			8	4	8			13		15	0		4		4	12	30
29	1KS16ME038	M.VENKATESH KASHYAP	7		14			12		8			4	9	5	6			8	4	8			11		11	0		4		4	12	56
30	1KS16ME040	MADAN.S	9		14			12		8			5	8	5	9			8	4	8			15		15	0		4		4	12	56
31	1KS16ME044	MANOJ.R	10		14			12		8			1	4	5	0			8	4	8			10		12	0		4		4	12	58
32	1KS16ME045	MOHAMMED YASIR RIAZ	0		0			12		8			2	8	4	8			8	4	8			9		13	0		4		4	12	51
33	1KS16ME046	MOHAN KUMAR.N	0		0			12		8			2	4	4	4			8	4	8			11		5	0		4		4	12	60
34	1KS16ME047	NAGARJUN.S	0		0			12		8			4	2	0	2			8	4	8			10		9	0		4		4	12	35
35	1KS16ME048	NAGARJUN.S	9		10			12		8			2	3	5	6			8	4	8			10		5	0		4		4	12	48
36	1KS16ME049	NAGESH.T.S	12		13			12		8			3	3	5	4			8	4	8			12		13	0		4		4	12	48
37	1KS16ME052	NAVEEN DESHPANDE	6		0			12		8			0	4	0	0			8	4	8			8		10	0		4		4	12	36
38	1KS16ME053	NITHIN.N	5		5			12		8			4	0	0	3			8	4	8			10		14	0		4		4	12	53
39	1KS16ME054	P.VIGNESH	11		14			12		8			5	9	5	9			8	4	8			0		0	0		4		4	12	63
40	1KS16ME055	PAPPU KUMAR SINGH	14		13			12		8			0	0	0	0			8	4	8			13		4	0		4		4	12	53
41	1KS16ME056	PAVAN KUMAR.L	8		11			12		8			4	2	5	5			8	4	8			6		3	0		4		4	12	43
42	1KS16ME057	PAVITHRA.B	0		0			12		8			5	5	5	5			8	4	8			15		15	0		4		4	12	56
43	1KS16ME058	PECHU MUTHU.S	14		12			12		8			5	9	5	2			8	4	8			0		0	0		4		4	12	51
44	1KS16ME060	PRAJWAL KRISHNA	0		0			12		8			0	0	0	0			8	4	8			12		12	0		4		4	12	43
45	1KS16ME061	PRAKASH RAJU.S	0		0			12		8			5	8	5	4			8	4	8			12		14	0		4		4	12	47
46	1KS16ME062	PRAMOD.R	0		0			12		8			3	8	5	5			8	4	8			14		14	0		4		4	12	67
47	1KS16ME063	PRAMOD RAJ.K	9		14			12		8			4	8	5	8			8	4	8			0		0	0		4		4	12	37
48	1KS16ME064	PRANAV.J.ATHREY	0		0			12		8			4	2	4	8			8	4	8			13		12	0		4		4	12	41
49	1KS16ME067	RAJKUMAR.S.K	0		0			12		8			4	3	5	4			8	4	8			12		10	0		4		4	12	45
50	1KS16ME069	RAMESH PAL.P	0		0			12		8			5	2	0	0			8	4	8			15		15	0		4		4	12	33
51	1KS16ME070	RISHI.R.NAIK	3		12			12		8			2	1	2	3			8	4	8			8		13	0		4		4	12	42
52	1KS16ME073	SAGAR.N	8		12			12		8			4	6	5	6			8	4	8			11		3	0		4		4	12	55
53	1KS16ME075	SHAIK MOINUDDIN	11		15			12		8			4	0	5	8			8	4	8			14		14	0		4		4	12	67
54	1KS16ME076	SHARATH.S.YADAV	4		10			12		8			5	4	2	0			8	4	8			0		0	0		4		4	12	45
55	1KS16ME081	SHIVARAJ.N.S	15		15			12		8			5	10	5	7			8	4	8			0		0	0		4		4	12	50
56	1KS16ME082	SHIVASHANKAR.B.M	15		15			12		8			5	9	5	10			8	4	8			0		0	0		4		4	12	53
57	1KS16ME083	SIRISH GOVARDHAN	15		15			12		8			0	0	0	0			8	4	8			15		14	0		4		4	12	47
58	1KS16ME084	SOWJANYA.D	11		9			12		8			5	0	5	10			8	4	8			15		15	0		4		4	12	48
59	1KS16ME085	SREEKARA.K.B	15		15			12		8			0	0	0	0			8	4	8			15		15	0		4		4	12	42
60	1KS16ME086	SUDARSHAN.T	13		9			12		8			5	5	5	1			8	4	8			15		13	0		4		4	12	41
61	1KS16ME087	SUDHARSHAN.M.D	0		0			12		8			5	10	5	4			8	4	8			15		15	0		4		4	12	61
62	1KS16ME089	SUMESH.R	0		0			12		8			0	0	0	0			8	4	8			15		15	0		4		4	12	57
63	1KS16ME090	SUPREETH.K.R	0		0			12		8			5	10	5	5			8	4	8			15		15	0		4		4	12	61
64	1KS16ME093	VARUN.C	0		0			12		8			5	10	2	7			8	4	8			15		15	0		4		4	12	43
65	1KS16ME094	VASANTH KUMAR.S	10		15			12		8			5	10	5	7			8	4	8			0		0	0		4		4	12	42
66	1KS16ME095	VIJAYA KUMAR.M.S	12		15			12		8			5	5	5	0			8	4	8			15		11	0		4		4	12	56
67	1KS16ME096	VIJAYKUMARNAIK.T.C	0		0			12		8			5	10	5	9			8	4	8			15		15	0		4		4	12	72
68	1KS16ME097	VINAY.B.V	0		0			12		8			5	3	5	10			8	4	8			15		15	0		4		4	12	36
69	1KS16ME098	VINAY.V.P	0		0			12		8			3	5	3	8			8	4	8			15		6	0		4		4	12	43

70	1KS16ME099	VINITH.P	9		15			12		8			5	5	5	3			8	4	8			0		0	0		4		4	12	59
71	1KS16ME100	VITHAN.T.R	10		15			12		8			0	0	0	0			8	4	8			15		0	0		4		4	12	58
72	1KS17ME401	ARUNKUMAR.E	0		0			12		8			5	5	3	5			8	4	8			11		15	0		4		4	12	48
73	1KS17ME402	ARUN KUMAR.R	10		15			12		8			5	5	5	2			8	4	8			0		0	0		4		4	12	42
74	1KS17ME404	CHETHAN.C.R	0		0			12		8			5	10	5	0			8	4	8			15		15	0		4		4	12	53
75	1KS17ME405	DARSHAN.H.R	0		3			12		8			5	3	5	3			8	4	8			15		14	0		4		4	12	46
76	1KS17ME406	DEEPAK.E	0		0			12		8			5	10	4	6			8	4	8			15		15	0		4		4	12	44
77	1KS17ME408	GUHAN BHASKAR	4		15			12		8			5	7	5	0			8	4	8			0		0	0		4		4	12	53
78	1KS17ME409	GURUPRASAD.T.M	10		15			12		8			5	10	2	0			8	4	8			0		0	0		4		4	12	44
79	1KS17ME410	GURUSWAMY.H	10		15			12		8			5	10	5	1			8	4	8			0		0	0		4		4	12	49
80	1KS17ME411	JEEVAN ABHISHEK	0		0			12		8			5	10	5	7			8	4	8			15		15	0		4		4	12	66
81	1KS17ME412	KANTHARAJU.K.N	0		0			12		8			5	5	5	5			8	4	8			10		14	0		4		4	12	58
82	1KS17ME413	KIRAN.S	0		0			12		8			5	5	4	4			8	4	8			14		11	0		4		4	12	39
83	1KS17ME415	LOHITH.R	10		15			12		8			5	5	5	5			8	4	8			15		15	0		4		4	12	55
84	1KS17ME416	MAHADEVA RAJU.H.E	7		10			12		8			5	9	4	2			8	4	8			15		15	0		4		4	12	40
85	1KS17ME417	MAHESH.D	0		0			12		8			5	10	5	5			8	4	8			15		15	0		4		4	12	47
86	1KS17ME418	MANISH.N.D	0		0			12		8			5	10	5	4			8	4	8			15		14	0		4		4	12	45
87	1KS17ME419	MITHUN.S	2		15			12		8			0	0	0	0			8	4	8			15		15	0		4		4	12	47
88	1KS17ME420	MOHAN KUMAR.C	0		0			12		8			5	6	5	2			8	4	8			15		15	0		4		4	12	46
89	1KS17ME421	MOHAN KUMAR.K	15		15			12		8			5	5	4	3			8	4	8			0		0	0		4		4	12	41
90	1KS17ME422	NAGESH.S	8		15			12		8			5	10	5	3			8	4	8			0		0	0		4		4	12	47
91	1KS17ME423	NIKHIL GOWDA.N.S	2		4			12		8			5	10	5	4			8	4	8			15		13	0		4		4	12	49
92	1KS17ME425	PRATAP.L	6		15			12		8			5	5	5	0			8	4	8			15		10	0		4		4	12	47
93	1KS17ME426	PRATHEEK.P	0		0			12		8			5	1	4	3			8	4	8			15		14	0		4		4	12	54
94	1KS17ME430	RAKESH.B.R	0		0			12		8			0	0	0	0			8	4	8			15		14	0		4		4	12	55
95	1KS17ME431	RAKSHITH.L	14		15			12		8			5	6	5	7			8	4	8			15		15	0		4		4	12	53
96	1KS17ME432	RAVI.K.R	11		4			12		8			0	0	0	0			8	4	8			14		14	0		4		4	12	48
97	1KS17ME434	SHASHANK.Y.K	0		0			12		8			5	10	5	5			8	4	8			15		14	0		4		4	12	54
98	1KS17ME435	SHASHIKUMAR.C.R	0		0			12		8			5	10	3	7			8	4	8			15		15	0		4		4	12	41
99	1KS17ME437	SRINIVASA.B.V	5		6			12		8			5	1	4	7			8	4	8			15		15	0		4		4	12	51
100	1KS17ME439	SURABHI.N	13		15			12		8			5	8	3	8			8	4	8			0		0	0		4		4	12	41
101	1KS17ME440	SUSHMA.Y.S	11		15			12		8			5	10	5	10			8	4	8			0		0	0		4		4	12	57
102	1KS17ME441	TEJAS.P.N	13		15			12		8			5	9	5	8			8	4	8			0		0	0		4		4	12	55
103	1KS17ME442	THRIVENI.M	0		0			12		8			5	10	5	10			8	4	8			11		12	0		4		4	12	57
104	1KS17ME444	VINAY.S	15		15			12		8			5	9	5	5			8	4	8			0		0	0		4		4	12	43
60% of Maximum marks (X)			09	00	09	00	00	07	00	05	00	00	03	06	03	06	00	00	05	02	05	00	00	06	00	06	06	00	02	00	02	07	48
No. of students above X			45	00	58	00	00	104	00	104	00	00	82	55	82	37	00	00	104	104	104	00	00	76	00	70	00	00	104	00	104	104	61
Total number of students (Y)			104	00	104	00	00	104	00	104	00	00	104	104	104	104	00	00	104	104	104	00	00	104	00	104	104	00	104	00	104	104	102
CO Percentage			43.27	#DIV/0!	55.77	#DIV/0!	#DIV/0!	100.00	#DIV/0!	100.00	#DIV/0!	#DIV/0!	78.85	52.88	78.85	35.58	#DIV/0!	#DIV/0!	100.00	100.00	100.00	#DIV/0!	#DIV/0!	73.08	#DIV/0!	67.31	00.00	#DIV/0!	100.00	#DIV/0!	100.00	100.00	59.80
			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	SEE
LEVEL			0	#DIV/0!	2	#DIV/0!	#DIV/0!	3	#DIV/0!	3	#DIV/0!	#DIV/0!	3	1	3	0	#DIV/0!	#DIV/0!	3	3	3	#DIV/0!	#DIV/0!	3	#DIV/0!	3	0	#DIV/0!	3	#DIV/0!	3	3	2

Method 1							
CO	CIE	SEE	DIRECT ATTAINMENT	Level	COURSE EXIT SURVEY	LEVEL	ATTAINMENT
CO1	71.15	59.80	65.48	3.00	60.00	3.00	3
CO2	66.35	59.80	63.08	3.00	60.00	3.00	3
CO3	74.52	59.80	67.16	3.00	60.00	3.00	3
CO4	69.31	59.80	64.56	3.00	60.00	3.00	3
CO5	68.32	59.80	64.06	3.00	60.00	3.00	3
AVERAGE							3.00



	IA1	A1	IA2	A2	IA3	A3	AVG
CO1	43.27	100.00	78.85	#DIV/0!	#DIV/0!	#DIV/0!	71.15
CO2	#DIV/0!	#DIV/0!	52.88	100.00	73.08	100.00	66.35
CO3	55.77	100.00	78.85	100.00	#DIV/0!	#DIV/0!	74.52
CO4	#DIV/0!	#DIV/0!	35.58	100.00	67.31	100.00	69.31
CO5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	00.00	100.00	68.32

79.59

						Co-Po Mapping Table								
CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	2	1			3	3	2	2	2		2	3	1
CO2	3	2	1			3	3	2	2	2		2	3	2
CO3	3	3	2	1	1	3	3	2	2	2	_	2	3	2
CO4	3	3	2	1	1	3	3	2	2	2	_	2	3	2
CO5	3	2	2	_	_	3	3	2	2	2	_	2	3	2
AVG	3.00	2.40	1.60	1.00	1.00	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	1.80

PO ATTAINMENT TABLE															
CO'S	CO Attainment in %	CO RESULT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1	3.00	Y	3.00	2.00	1.00	_	_	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	1.00
CO2	3.00	Y	3.00	2.00	1.00	_	_	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	2.00
CO3	3.00	Y	3.00	3.00	2.00	1.00	1.00	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	2.00
CO4	3.00	Y	3.00	3.00	2.00	1.00	1.00	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	2.00
CO5	3.00	Y	3.00	2.00	2.00	_	_	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	2.00
Average			3.00	2.40	1.60	1.00	1.00	3.00	3.00	2.00	2.00	2.00	_	2.00	3.00	1.80

K. S. INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

Challenging Questions for Toppers

Academic Year	**2019-2020**		
Batch	**2016-2020**		
Year/Semester/section	**IV/VII/B**		
Subject Code-Title	**15ME71-ENERGY ENGINEERING**		
Name of the Instructor	**PRASAD K**	**Dept**	**ME**

1) Explain the energy scenario in India
2) Explain the working principle of High pressure boiler
3) What are the factors affecting ash handling system.
4) Explain the function of cyclone burner and tangential burner
5) Hoe to harnessing the energy from tidal power plant
6) With neat sketch explain the working principle of geothermal energy plant
7) With neat sketch explain KVIC biogas plant
8) What are the factors affecting biogas generation
9) Write short notes on energy cell
10) Explain zero energy concept

REFERENCE:

1. **Power Plant Engineering**, P.K Nag, 3rd Ed. Tata McGraw Hill 2nd edition 2001.
2. **Power Plant Engineering.** Morse F.T., Van Nstrand.1998.
3. **Power Plant Technology**, M.M. EL-Wakil, McGraw Hill, International. 1994.
4. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
5. **Power Plant Engineering,** AK Raja.
6. **Power Plant Engineering,** RK Hegde.

Signature of Staff

Signature of HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

MODULE-1

UNIT -1 STEAM POWER PLANT

1) Explain with neat sketch overfeed and under feed principle of firing coal.
2) With neat sketch explain the fallowing : i) Chain grate stoke ii) multi retort stoker
3) Explain with neat sketch unit system and Bin(central) system of pulverized coal firing
4) With neat sketch explain any two coal handling system.
5) With neat sketch explain i) Cyclone burner ii) Tangential burner
6) Draw the line diagram of pneumatic ash handling system and Explain the difficulties encountered in its design and operations

UNIT -2 STEAM GENERATION (BOILER)

1) With neat sketch give brief account of fallowing boilers
i) Benson boiler ii) Velox steam generators iii) La mont boiler iv) Schmidt Hartman boiler.

2) Explain the fallowing: i) Natural draught ii) Forced draught iii) Induced draught iv) Balanced draught.

3) Explain the function of any one cooling tower

4) What is the function of air heater? Explain recuperative air heater

5) What is super heater? State the advantages of super heated steam.

6) Derive the expression of height of chimney

PRASAD K
ASSOCIATE . Professor, Department Of Mechanical Engineering
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MODULE-2

UNIT - 3 DIESEL ENGINE POWER PLANT

1) Draw the layout of diesel power plant and explain its operation.
2) Draw the schematic layout of the diesel power plant and explain the function of the components.
3) What are all the application of diesel engine in power field?
4) What are advantages and disadvantages of diesel power plant?
5) Describe the different methods of starting the diesel engine.
6) Explain thermo syphon cooling system with neat sketch.
7) Explain the necessity of cooling system in diesel engine. With help of neat diagram explain thermo static cooling system.
8) Explain the working of principle of a) thermo syphon cooling b) thermostatic cooling
9) Explain the necessity of lubrication system in diesel power plant and explain any one lubrication system
10) Explain the fallowing : 1)splash lubrication system 2) pressure feed lubrication system or 3) dry sump lubrication system

UNIT -4 HYDRO - ELECTRIC POWER PLANTS

1) Draw the general layout of hydroelectric power plant.
2) What are the essential elements of hydroelectric power plant? Explain them in brief.
3) State the important factors to be considered while selecting the site for hydroelectric power plant.
4) How the hydroelectric plants are classified? With neat sketch explain pumped storage plant
5) Explain i) low head medium ii) medium head iii) high head plant.
6) Explain the fallowing: i) Penstock ii) Surge tank iii) Water hammer.
7) Differentiate between: i)pond age and storage ii) Base load plant and peak load plant.
8) Explain the function fallowing in hydroelectric power plant : a) Spillway b) Fore bay
9) What is function of control gate in hydro power station? Explain any one.
10) Explain the fallowing : i) Needle valve ii) Tube valve
11) What is the function of draft tube? Describe the types of draft tube.
12) Explain the fallowing terms with reference to Hydroelectric power plant : i) Runoff ii) Hydrograph iii) Flow duration curve iv) mass curve

MODULE-3

UNIT -5 SOLAR ENERGY:

1) Define The terms: i) Solar constant ii) Direct radiation iii) diffused radiation iv) Extra terrestrial radiation
2) Distinguish between beam and diffuse solar radiation
3) Give the advantages and disadvantages of solar Energy.
4) Classify solar radiation measuring instruments. Explain any one of instrument with sketch
5) Distinguish between Pyrheliometer and Pyranometer

UNIT -6 APPLICATIONS OF SOLAR ENERGY

1) With neat sketch explain flat plate solar collector.
2) Explain the factors affecting performance of FPC
3) Sketch & explain the principle of working of solar pond.
4) What is Photo voltaic cell?
5) Briefly explain the working principle of solar cell and discuss the parameter affecting the performance.

MODULE-4

UNIT -7 WIND ENERGY

1) What are the constraints in the wind energy utilization?
2) Draw neat figures and label the parts of i) Horizontal axis wind machine ii) Vertical axis wind machine
3) Explain with neat sketch i) Horizontal axis wind machine ii) Vertical axis wind machine
4) What are different types of wind mill rotor? Explain the for criteria selection.
5) Discuss the aerodynamics consideration in the wind mill stream.

UNIT -8 TIDAL ENERGY

1) How the power is obtained from tides? Classify the tidal power plant
2) Discuss the advantages and limitations of tidal power generation
3) Explain the principle by which tides are formed.
4) How the power can be obtained from tides? How tidal plants are classified?
5) Explain the method of harnessing the tidal energy.
6) State the limitations of tidal power plant
7) With neat sketch explain the fallowing: I) single basin tidal plant ii) double basin tidal plant.
8) Write advantages and disadvantages of tidal power plant

MODULE-5

UNIT -9 BIOMASS ENERGY

1) What is the difference between Biomass and biogas
2) Write the short notes on i) Anaerobic digestion ii) fermentation iii) Photosynthesis.
3) What are the different ways of converting biomass in to energy? explain any one method
4) What are factors affecting biogas generation? explain briefly
5) With neat sketch explain the i) Fixed dome type biogas plant ii) Floating drum type biogas plant
6) Write short notes: i) Energy plantation ii) Biogas Plant iii) Effect of temperature on biogas generation
7) How gasifiers are classified? With neat sketch explain the working of down draught gasifier.

UNIT -10 GREEN ENERGY

1) What is fuel cell? Classify the fuel cell.
2) Explain the working principle of fuel cell.
3) Explain the nuclear reactor with neat sketch.
4) Explain with neat sketch Rankine cycle OTEC plant
5) With neat sketch explain the principle of harnessing the energy from geothermal plant
6) Explain the concept of zero energy

COURSE INCHARGE

HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109.

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10ME53

Fifth Semester B.E. Degree Examination, December 2012
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Differentiate Stokes firing and pulverized fuel burning of coal. **(06 Marks)**
b. Sketch and explain bowl pulverizing mill. **(07 Marks)**
c. Explain pneumatic ash handling system with a neat sketch. **(07 Marks)**

2 a. Define draught and explain the operation of induced draught system with a neat sketch. **(08 Marks)**
b. Define cooling tower and explain the principle of operation of hyperbolic cooling tower, with a neat sketch. **(08 Marks)**
c. Explain any two boiler accessories used in steam generators. **(04 Marks)**

3 a. Draw the general layout of diesel power plant. **(04 Marks)**
b. Describe the different methods of starting the diesel engine. **(06 Marks)**
c. Explain the necessity of cooling and lubrication of diesel engine. Sketch and explain splash lubrication system. **(10 Marks)**

4 a. Classify hydro-electric power plant. **(04 Marks)**
b. Differentiate between:
i) Pondage and storage type of hydel power plant.
ii) Forebay and surge tank. **(06 Marks)**
c. The mean weekly discharge at a hydel power plant site is given below: flow is given in millions of cubic metre per week.

Week	1	2	3	4	5	6	7	8	9	10	11	12
Flow	160	200	300	1100	700	900	700	600	1000	600	400	300

i) Draw the hydrograph and find the average flow available for the whole period.
ii) Develop the flow duration curve and plot it.
iii) Determine the power that can be produced for the mean flow of water if the available head is 100m and overall efficiency of generation is 82%. **(10 Marks)**

PART – B

5 a. Explain nuclear reactor with a neat sketch. **(07 Marks)**
b. Explain pressurized water reactor with a neat sketch. **(07 Marks)**
c. Write note on :
i) Radiation hazards.
ii) Radio active waste disposal. **(06 Marks)**

6 a. Explain the methods of harnessing solar energy. **(06 Marks)**
b. Explain how wind energy can be harnessed using horizontal axis wind mill. **(06 Marks)**
c. Wind speed at a location V_i = 30 miles/hr (13.42 m/s) the speed at turbine rotor is 60% of this value and the speed at exit is 30% of V_i. The rotor diameter is 9m, density ρ = 1.293 kg/m^3. Calculate:
i) The power available in the wind at the turbine rotor
ii) The power in wind at outlet
iii) The power developed by the turbine
iv) The coefficient of performance. **(08 Marks)**

7 a. Explain the method of harnessing tidal energy. **(06 Marks)**
b. Explain OTEC plant with a neat sketch. **(07 Marks)**
c. With a neat sketch, explain the working of hot dry rock geothermal plant. **(07 Marks)**

8 a. Write short notes on:
i) Photosynthesis
ii) Energy plantation. **(06 Marks)**
b. Classify gasifiers and explain the factors affecting bio-gas generation. **(06 Marks)**
c. Explain bio-gas plant with a neat sketch. **(08 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, Dec.2013 / Jan. 2014
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. Sketch and explain traveling grate stoker. (07 Marks)
b. Write the advantages and disadvantages of using pulverized coal in thermal power plants. (05 Marks)
c. Explain hydraulic ash handling system, with a neat sketch. (08 Marks)

2 a. Sketch and explain Bension boiler. (07 Marks)
b. Define draught and explain forced draught, with a neat sketch. (06 Marks)
c. Define cooling tower and explain hyperbolic cooling tower, with a neat sketch. (07 Marks)

3 a. Draw the layout of diesel power plant and explain its operation. (07 Marks)
b. Explain thermo Syphon cooling with a neat sketch. (07 Marks)
c. Explain different starting methods for diesel engine. (06 Marks)

4 a. Draw the general layout of hydel power plant. (04 Marks)
b. Differentiate the following with reference to hydel power plant :
i) Pondage and storage ii) Base load and peak load plants. (06 Marks)
c. The discharge through a monsoon stream are tabulated below :

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Discharge m^3/s	2.0	1.5	1.0	0.6	0.0	0.0	8.0	10.0	12.0	6.0	4.0	3.0

i) Draw the hydrograph and calculate the average flow.
ii) Determine the capacity of the reservoir for the obtained average flow if a dam is constructed across the stream.
iii) If the mean level of water on the upstream side is 100m above the tail race, find the power in kW that could be generated assuming 80% generator efficiency. (10 Marks)

PART - B

5 a. Define nuclear reactor. Sketch and explain nuclear reactor. (08 Marks)
b. Explain boiling water reactor with a neat sketch. (06 Marks)
c. Write a note on : i) Radiation hazards and ii) Radioactive waste disposal. (06 Marks)

6 a. Explain one typical method of harnessing energy from the given below natural sources with a neat sketch : i) Solar energy ii) Wind energy. (14 Marks)
b. Write the advantages and disadvantages of non – conventional energy conversions. (06 Marks)

7 a. Explain the principle of harnessing energy from the following sources of energy, with a neat sketch : i) Tidal energy ii) Ocean thermal energy and iii) Geothermal energy. (15 Marks)
b. Explain the principle by which tides are formed. (05 Marks)

8 a. Explain the factors affecting biogas generation. (04 Marks)
b. Explain the principle by which biogas is produced, with a neat sketch. (10 Marks)
c. Explain i) Anaerobic fermentation ii) Photo synthesis. (06 Marks)

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10ME53

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. With a neat sketch, explain the working of spreader stoker. State the advantages and disadvantages. **(10 Marks)**
b. With a neat sketch, explain hydraulic ash handling system. **(06 Marks)**
c. List the different types of fuels used for steam generation. **(04 Marks)**

2 a. Explain with a neat sketch, working of Volex boiler. **(08 Marks)**
b. Draw the neat sketch of Induced Draugh system. Explain. **(08 Marks)**
c. What are Super heaters and Economiser? **(04 Marks)**

3 a. Explain the necessity of cooling system in diesel engine. With the help of neat sketch, explain thermostat cooling and thermisiphon cooling. **(08 Marks)**
b. Draw schematic layout of diesel power plant and explain function of the components. **(12 Marks)**

4 a. Classify Hydro – electric power plant. **(04 Marks)**
b. Explain with neat sketches, any three different types of surge tank. **(06 Marks)**
c. The run – off data of river at a particular site is tabulated below :

Month	Mean Discharge in millions of cu/month	Month	Mean Discharge in millions of cu/month
Jan	40	July	70
Feb	25	Aug	100
Mar	20	Sept	105
Apr	10	Oct	60
May	0	Nov	50
June	50	Dec	40

i) Draw hydrograph and find the mean flow ii) Draw the flow duration curve
iii) Find the power in MW available at mean flow, if the head available is 100m and overall efficiency of generation is 80%. **(10 Marks)**

PART - B

5 a. With the help of neat diagram, explain the working of Liquid Metal Cooled Reactor. **(08 Marks)**
b. Explain about disposal of solid, liquid and gaseous wastes produced by Nuclear Power Plant. **(07 Marks)**
c. Explain advantages and disadvantages of Nuclear power plant. **(05 Marks)**

6 a. Draw a neat sketch, explain Solar Pond Electric Power Plant. Draw concentration and temperature profile. **(08 Marks)**
b. Briefly explain the working of solar cell. **(04 Marks)**

c. Wind blows with velocity of 16m/s at 15^0C. The turbine diameter is 115m with operating speed of 40 rpm at maximum efficiency. Assume 1 standard atmospheric pressure and propeller wind turbine. Calculate the following :
i) Total power density in the wind stream ii) Maximum obtainable power density
iii) Reasonably obtainable power density, $\eta = 35\%$ iv) Total power
v) Torque and axial thrust. **(08 Marks)**

7 a. With a neat sketch and TS diagram, explain closed cycle OTEC. **(07 Marks)**
b. Draw a neat sketch and explain the working of Double basin tidal power plant. **(06 Marks)**
c. With a neat sketch, explain the working of Vapour dominated – total flow concept Geothermal system. **(07 Marks)**

8 a. Explain the factors affecting Biogas generation. **(10 Marks)**
b. With a neat sketch, explain the working of Updraft gasifier. Mention the temperature ranges. **(07 Marks)**
c. Write a note on Energy plantation. **(03 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain Cyclone burner, along with proper sketch. **(06 Marks)**
b. Explain various coal handling techniques. **(08 Marks)**
c. Prepare a neat sketch for hydraulic ash handling system and explain. **(06 Marks)**

2 a. Give a neat sketch for Benson boiler and write the operating principle. **(08 Marks)**
b. Explain briefly about i) Economiser ii) Air preheater. **(06 Marks)**
c. Derive an expression for chimney height. **(06 Marks)**

3 a. Write the advantages and disadvantages of diesel power plant. **(06 Marks)**
b. Explain with neat sketch, Individual pump injection system and common rail injection system in diesel power plant. **(08 Marks)**
c. What is meant by thermostat cooling in diesel power plants? **(06 Marks)**

4 a. Give a brief note on i) Hydrograph ii) Flow duration curve. **(06 Marks)**
b. Draw a general layout of hydro – electric power plant and explain the functions of each part. **(08 Marks)**
c. Explain briefly about : i) Water hammer effect ii) Surge tank. **(06 Marks)**

PART – B

5 a. Explain with neat sketch, the layout of nuclear power plant. **(08 Marks)**
b. State the functions of moderator, control rods and reflector. **(06 Marks)**
c. Explain with neat sketch, the working of pressurized water reactor. **(06 Marks)**

6 a. Explain with proper sketch, about solar P-V conversion system. **(06 Marks)**
b. Give a brief note on horizontal and vertical axis wind mill system. **(06 Marks)**
c. The incident beam of sunlight has a power density of 1 kW/m^2 in the direction of beam. The angle of inclination is 60^0. Calculate the power collected by the surface, having a total flat area of $120m^2$. **(08 Marks)**

7 a. Give a short note on tidal power plant. **(06 Marks)**
b. Explain briefly about OTEC plants. **(08 Marks)**
c. What is meant by Geothermal energy conversion? **(06 Marks)**

8 a. What are the stages in anaerobic digestion process? Explain. **(06 Marks)**
b. With neat sketch, explain the working of floating type digester. **(08 Marks)**
c. What are the factors affecting the generation of biogas in a digester? **(06 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, June / July 2014
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. ***Assume missing data, if any, suitably.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - A

1 a. With a neat sketch, explain the working of spreader stroker. State the limitations of it. **(10 Marks)**

b. Draw a line diagram of Pneumatic ash handling system and explain its working. Mention its advantages. **(10 Marks)**

2 a. What are the advantages and disadvantages of high pressure boilers? With a neat sketch, explain the working of Benson boiler. **(10 Marks)**

b. What is draught? Mention types of draught and explain any one type, with neat sketch. **(10 Marks)**

3 a. Draw a line diagram to shown the layout of diesel power plant. Describe it in brief. **(10 Marks)**

b. State the applications of diesel engines in power fluid. List the advantages and disadvantages of diesel power plant. **(10 Marks)**

4 a. How are the hydro – electric power plant classified? With a neat sketch, explain the pumped storage plant. **(10 Marks)**

b. At a particular site, the mean monthly discharge: (in millions of m^3) of a river in 12 months from January to December are 30, 25, 20, 0, 10, 50, 80, 100, 110, 65, 45 and 30 respectively. Draw the hydrograph and flow duration curve and find mean flow. Also find the power available at mean flow. If the head available is 90m and the overall efficiency of generation is 85%. Assume each month of 30 days. **(10 Marks)**

PART - B

5 a. Draw a schematic diagram of a PWR, label all the parts. State the function of each component. **(10 Marks)**

b. Explain the following : i) Reactor shielding ii) Radio active waste disposal. **(10 Marks)**

6 a. With a neat sketch, explain the working of an instrument used to measure global radiation of solar energy. **(10 Marks)**

b With a neat sketch, explain solar pond electric power plant. Mention applications of solar pond. **(10 Marks)**

7 a. Explain the principle of working of OTEC. Explain with a neat sketch, Rankine cycle OTEC plant. **(10 Marks)**

b. i) What are the factors considered for selecting a suitable site for tidal power plant? **(05 Marks)**

ii) With a neat sketch, explain the working of "Hot dry rock" geothermal plant. **(05 Marks)**

8 a. What is meant by anaerobic digestion? What are the factors which affect bio-digestion? Explain in brief. **(10 Marks)**

b. How are gasifiers classified? With a schematic diagram, explain the working of down draft gasifier. **(10 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, June/July 2017
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain the principle of overfeed and underfeed strokers, with neat sketches. **(10 Marks)**
b. Explain a typical hydraulic ash handling system, with neat sketch. **(06 Marks)**
c. List the advantages and disadvantages of pulverized fuel. **(04 Marks)**

2 a. With a neat diagram, explain the working principle of Benson Boiler. **(08 Marks)**
b. Mention the various types of draught systems used at Chimneys and explain them with neat sketch. **(12 Marks)**

3 a. With the help of simple sketch, explain the working of Diesel Engine Power plant. **(10 Marks)**
b. Name the various starting methods used for diesel engines and explain them. **(10 Marks)**

4 a. Draw a typical layout of hydroelectric power plant and explain its working principle. **(08 Marks)**
b. What is a hydrograph? Write its uses. **(04 Marks)**
c. List the different types of surge tanks and explain them in brief. **(08 Marks)**

PART – B

5 a. Compare Fission and Fusion processes. **(04 Marks)**
b. With a neat sketch, explain working principle of Boiling Water Reactor (BWR) and mention its merits and demerits. **(10 Marks)**
c. Describe the Radioactive wastes disposal methods. **(06 Marks)**

6 a. Name Solar Radiation measuring instruments and explain any one with neat sketch. **(10 Marks)**
b. Wind blows with velocity of 16 m/s and at 15^0C. Assume 'One' standard atmospheric pressure. If the turbine diameter is 115m and operating at 40 RPM at maximum efficiency. Calculate axial thrust and torque at maximum efficiency. Assume propeller type wind turbine. **(10 Marks)**

7 a. With a neat diagram, explain the working principle of Rankine Cycle – OTEC power plant. **(10 Marks)**
b. Name the different Hydro Thermal convective system and explain any one system, with a neat sketch. **(10 Marks)**

8 a. Explain the difference between biomass and biogas. **(03 Marks)**
b. Describe the factors affecting biogas production. **(05 Marks)**
c. With a neat sketch, explain the construction and working of KVIC digester. **(12 Marks)**

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Code No: **RT42033D** **R13** **Set No. 1**

IV B.Tech II Semester Regular Examinations, April/May - 2017

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

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PART–A *(22 Marks)*

1. a) What is the function of cooling tower? [4]
   b) Draw the layout of diesel power plant? [4]
   c) List out the drainage area characteristics? [4]
   d) State the advantages of fast breeder reactors? [3]
   e) List out the advantages and disadvantages of nuclear plants over conventional thermal plants. [4]
   f) What are fixed and operating costs? [3]

PART–B *(3x16 = 48 Marks)*

2. a) Enumerate and explain the steps involved in coal handling. [8]
   b) Explain the general layout of ash handling and dust collection systems. [8]

3. a) Draw and explain the layout of modern diesel power plant showing the following systems.
   (i) Fuel supply system
   (ii) Lubrication system [8]
   b) Discuss the advantages of combined cycle power generation. Explain the working of GT-ST combined cycle plant. [8]

4. a) What is a spillway? Why are spillways required? What are the different types of spillways? [8]
   b) Explain with a neat sketch a pumped storage hydro plant, state its advantages [8]

5. a) Enumerate and explain the essential components of a nuclear reactor. [8]
   b) Explain about sodium-graphite reactor with a neat sketch [8]

6. a) Explain the working principle of hydroelectric and gas turbine station. [8]
   b) With a neat sketch explain the working of photo cell type smoke meter. [8]

7. a) Define peak load, demand factor, load factor and plant use factor. [8]
   b) Explain briefly various methods of pollution. [8]

Code No: **RT42033D** **R13** **Set No. 2**

IV B.Tech II Semester Regular Examinations, April/May - 2017

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

*****

PART–A *(22 Marks)*

1. a) What are the methods used for handling of coal? [3]
   b) What are the components of gas turbine power plants? [4]
   c) Explain about hydrograph. [4]
   d) Explain the function of nuclear reactor? [4]
   e) State the advantages of combined power plants. [3]
   f) What is the significance of load curves? [4]

PART–B *(3x16 = 48 Marks)*

2. a) How does a cooling tower operate? Mention its merits and demerits. [8]
   b) Explain the various draught systems with a neat sketch [8]

3. a) Draw a neat line diagram of a diesel power plant showing all the systems and explain the working [8]
   b) Mention the advantages and disadvantages of diesel power plant over a gas turbine power plant? [8]

4. a) State the functions of a dam. How are dams classified? Briefly describe a few important types of dams. How would you select the site and the type of the dam? [10]
   b) How hydro electric power plants are classified? [6]

5. a) Explain with a line diagram, the working of homogeneous reactor. [6]
   b) Sketch and explain gas cooled reactor and also its advantages [10]

6. a) Explain the working of run-of-river plant in combination with steam plant. [8]
   b) Explain with a neat line diagram the circuit to analyse the gas for nuclear radiation. [8]

7. A power station has to supply load as follows:

Time(hrs)	0-6	6-12	12-14	14-18	18-24
Load(MW)	30	90	60	100	50

(i) Draw the load curve
(ii) Draw the load-duration curve
(iii) Give a scheme of suitable generating units to supply the level
(iv) Calculate load factor, capacity of the plant and plant capacity factor [16]

Code No: **RT42033D** **R13** **Set No. 3**

IV B.Tech II Semester Regular Examinations, April/May - 2017

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

*****

PART–A *(22 Marks)*

1. a) What are the uses of ash? [3]
   b) What are the components of diesel power plants? [3]
   c) Classify different types of dams. [4]
   d) Mention the various types of fast breeders. [4]
   e) List out the techniques for measuring water purity. [4]
   f) How the load duration curve is is constructed. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain the working of spreader stoker with neat sketch. [8]
   b) What are the different types of cooling towers ?Explain with a neat sketch [8]

3. a) Give the classification of gas turbine power plant? [8]
   b) Supercharging-explain with advantages and disadvantages [8]

4. The turn off data of a river at a particular site is tabulated below.

Month	Mean discharge (millions of cu.m.)	Month	Mean discharge (millions of cu.m.)
January	30	July	80
February	25	August	100
March	20	September	110
April	0	October	65
May	10	November	45
June	50	December	30

(i)Draw the hydrograph and find the mean flow.
(ii)Draw the flow duration curve.
(iii)Find the power developed if the head available is 90m and the overall efficiency of generation is 86 percent. Assume each month of 30 days. [16]

5. a) Explain the construction and working of nuclear power plant with a layout [8]
   b) Describe with the help of a neat sketch the construction working of a pressurized water reactor. What are the advantages and disadvantages? [8]

6. a) Draw the electric line diagram to measure CO_2 in the flue gases and explain the working [8]
   b) Explain the working of pump storage type plant in combination with steam plant. [8]

7. a) What do you understand by load factor and capacity factor? When are they numerically equal? [8]
   b) What are the various costs involved in power plant? Discuss briefly. [8]

Code No: **RT42033D** **R13** **Set No. 4**

IV B.Tech II Semester Regular Examinations, April/May - 2017

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any THREE questions from Part-B

*****

PART–A *(22 Marks)*

1. a) What is the function of a coal crusher [4]
   b) What are the different types of engines used in diesel power plants? [3]
   c) Define Spill way? Classify different types of spill ways. [4]
   d) How the nuclear reactors are classified? [4]
   e) Explain the importance of measurement in power plant [4]
   f) What do you mean by diversity factor? [3]

PART–B *(3x16 = 48 Marks)*

2. a) Explain the working principle of cyclone furnace with neat diagram. [8]
   b) Classify the pulverised fuel burners and list the requirements of them. [8]

3. a) List the essential components of gas turbine power plant and explain them briefly [8]
   b) Explain how engines are selected for diesel power plants [8]

4. a) What you mean by storage and pondage. Why are they required? [8]
   b) What do you understand by pumped storage plant? [8]

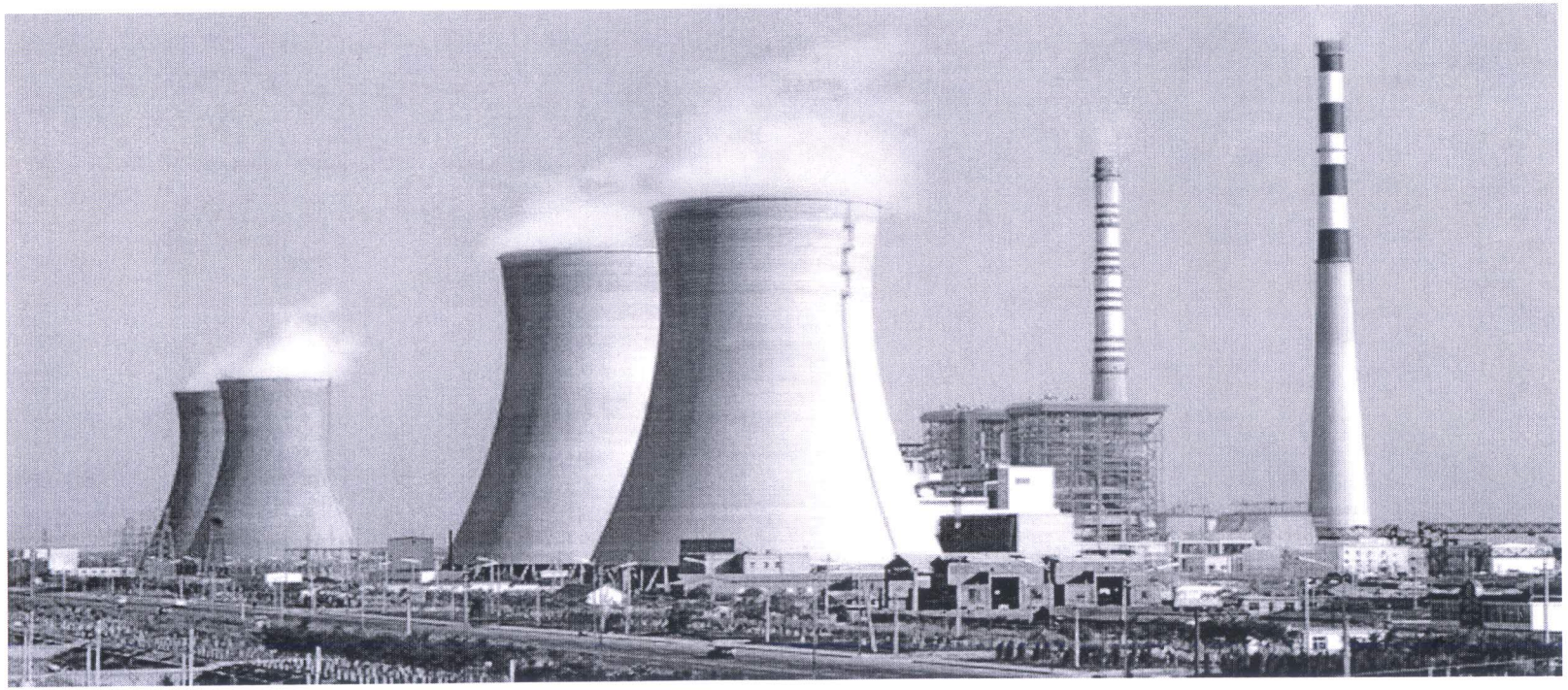
5. a) Explain the working of a typical fast breeder nuclear power plant with neat diagram. [8]
   b) Explain briefly about radiation hazards and scheduling? [8]

6. a) Explain the magnetic wind method for the measurement of O_2 in the flue gases. [8]
   b) Explain the working of run-off-river plant in combination with steam plant. [8]

7. a) Define pollution and pollutants. [8]
   b) Estimate the generating cost per unit supplied from a power plant having the following data
   Plant capacity = 120 MW.
   Capital cost = Rs.600 × 106
   Annual load factor = 40 %
   Annual cost of fuel, taxation, oil and salaries = Rs.500000
   Interest and depreciation = 12 % [8]

MODULE -1

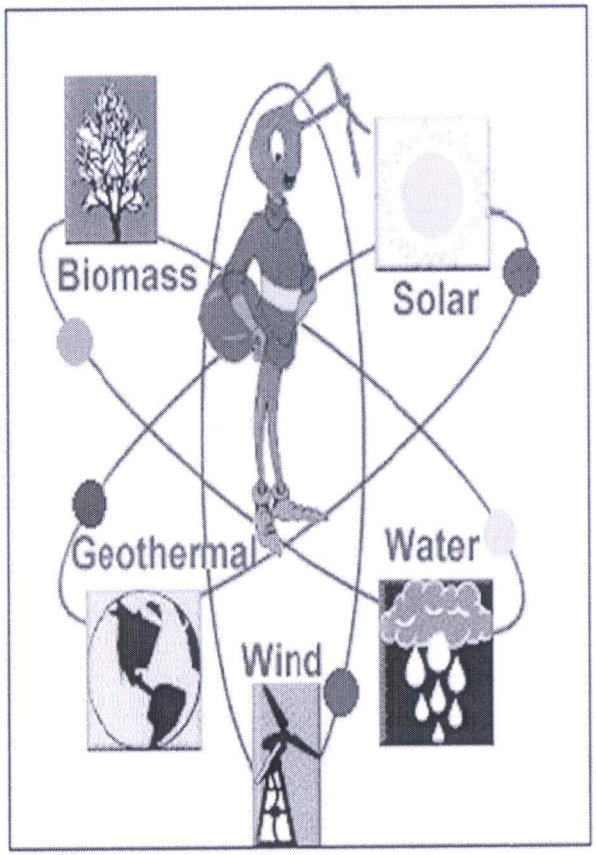
THERMAL ENERGY CONVERSION SYSTEM



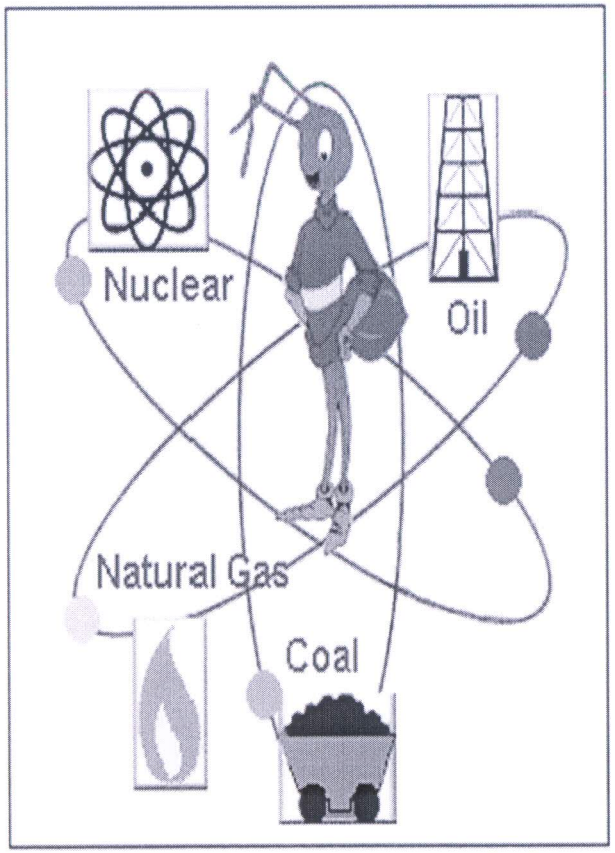
Review of energy scenario in India:

- Energy is one of the major inputs for the economic development of any country. In the case of the developing countries, the energy sector assumes a critical importance in view of the ever increasing energy needs requiring huge investments to meet them.
- In the present scenario, the electricity has become an essential commodity rather than luxury. The power plant will become important in the areas where hydro sources are not adequate.
- thermal power is the largest sources of power in India. About 75% of electricity consumed in India is generated by thermal power plants at present 54.09% or 93918.38MW of the total electricity production in India is from coal based thermal power station

General Philosophy and need of Energy

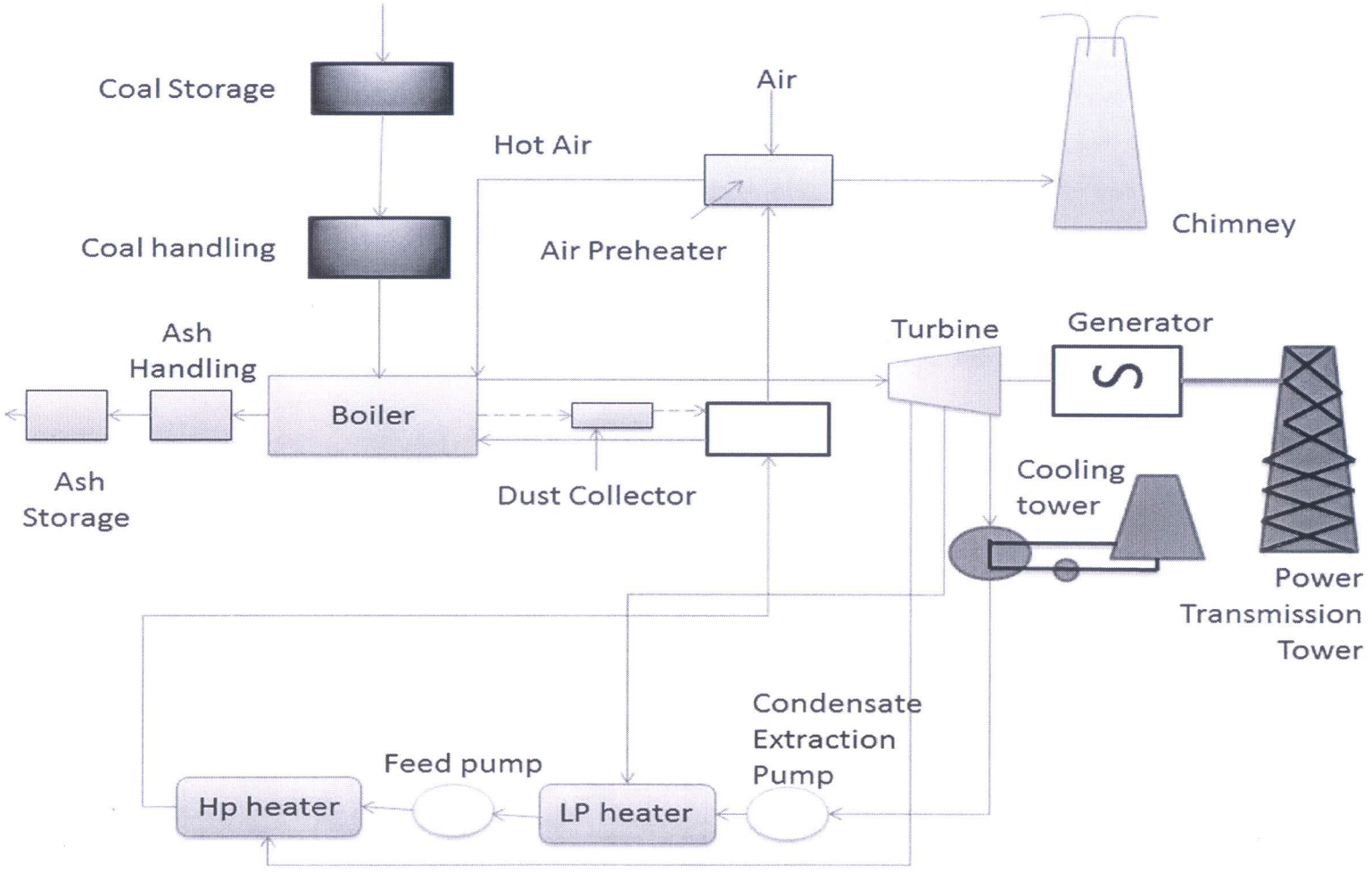


Renewable



Non-Renewable

Layout of steam power plant



Different Types of Fuels

Fuels are the chemical compounds of carbon and hydrogen which can be burnt with oxygen produces heat energy . Some times they contain small amount of sulphur or minerals

Requirements of good fuel:

1.It should have a high calorific value

2. It should not produce smoke and harmful gases

3. It should burn efficiently.

4. It should available at a cheaper cost and in abundant quantity.

- Fuels also are broadly classified in to two types:

A) Primary fuels

B) Secondary fuels

Primary fuels are obtained from nature

Ex: Wood, Petroleum , Coal, Natural gas e.t.c

Secondary fuels are prepared fuels

Ex: Kerosene, Charcoal, Alcohol, Producer gas e.t.c

(4) Because of low velocity of air, there is no proper mixing of air and fuel in the combustion chamber. This leads to poor combustion

(5) The chimney has no flexibility to create more draught under peak load conditions as the draught available is constant for a particular height of chimney

(6) chimney draught is only used for very small boilers.

Calculations in Natural draught system

The pressure acting on the grate from chimney side

$P_1 = P_a + P_g$

$= P_a + w_g H$

P_a = Atmospheric pressure

P_g = Pressure of hot gases

$= w_g H$ $\quad P_g = \rho_g g H$

w_g = Specific weight of hot gases

H = Height of the chimney

Pressure acting on the grate from atmospheric side

$P_2 = P_a + w_a H$

w_a = Specific wt. of atmospheric air

The Net pressure acting on the grate of a combustion chamber

$P = P_2 - P_1$

$= (P_a + w_a H) - (P_a + w_g H)$

$P = (w_a - w_g) H$

weight per unit volume of a material

$w_w = 9.807$ kN/m³

The net pressure in terms of water head

$h_w \times w_w = (w_a - w_g) H$

$w_a = 1.225$

$h_w \times 1000 \times g = (\omega_a - \omega_g) H$

$= (\rho_a - \rho_g) g H$

$h_w \times 1000 = (\rho_a - \rho_g) H$

If h_w is in mm

then $h_w = (\rho_a - \rho_g) H$ mm of water

Note: (1) Condition for maximum discharge through the chimney

$\frac{T_g}{T_a} = 2 \left(\frac{m_a + 1}{m_a}\right)$

T_g and T_a = Temperature of hot gas and air

m_a = mass of air supplied per kg of fuel.

(2) Draught in mm for maximum discharge

$h_w = \frac{176.5 H}{T_a}$ mm of water

(3) maximum discharge of gases through chimney

$m_g = \frac{A P_g}{R_g} \sqrt{2gH} \cdot \left(\frac{m_a}{m_a + 1}\right) \frac{1}{2 T_a}$

A = C.S. area of the chimney at bottom

P_g = Pressure of hot gases

R_g = Gas constant of hot gases.

Expression for chimney Height

W.K.T

Net pressure acting on the grate of furnace

$\Delta P = (\omega_a - \omega_g) H$

$\Delta P = (\rho_a - \rho_g) g H$ — (1)

Let m_a = mass of air supplied / Kg of fuel

T_a and T_g → absolute temps of atm. air and hot gases

Assume, Volume of combustion products = volume of air supplied.

Now $\frac{\text{mass of hot gas}}{\text{Mass of air}} = \frac{m_a + 1}{m_a}$ [1 → 1 kg of fuel]

From ideal eqn

$\rho_a = \frac{P}{RT_a}$ or $\rho_a = \frac{1.0132 \times 10^5}{287 \times T_a} = \frac{353}{T_a}$

$\rho_g = \frac{P}{RT_g}\left(\frac{m_a+1}{m_a}\right) = \frac{1.0132 \times 10^5}{287 \times T_g}\left[\frac{m_a+1}{m_a}\right] = \frac{353}{T_g}\left(\frac{m_a+1}{m_a}\right)$

Now $\Delta P = \left[\frac{353}{T_a} - \frac{353}{T_g}\left(\frac{m_a+1}{m_a}\right)\right] g H$

$\Delta P = 353 g H \left[\frac{1}{T_a} - \frac{1}{T_g}\left(\frac{m_a+1}{m_a}\right)\right]$ — (2)

Let $\Delta P = \rho_g g h_g$ → h_g = pressure head in terms of gas column.

$\Delta P = \frac{353}{T_g}\left(\frac{m_a+1}{m_a}\right) g h_g$ — (3)

$\omega = \frac{mg}{V} = \rho g$

Equating (2) and (3)

$353 g H \left[\frac{1}{T_a} - \frac{1}{T_g}\left(\frac{m_a+1}{m_a}\right)\right] = \frac{353}{T_g}\left(\frac{m_a+1}{m_a}\right) g h_g$

$\boxed{h_g = H\left[\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right) - 1\right]}$

In terms of mm of water

$h_g = \frac{h_w \times \rho_w}{\rho_g} = \frac{h_w \times 1000}{\frac{353}{T_g}\left(\frac{m_a+1}{m_a}\right)}$

$h_g = h_w \times 1000 \frac{T_g}{353}\left(\frac{m_a}{m_a+1}\right)$

Simplifying, we get

$$h_w = 353\left[\frac{1}{T_a} - \frac{1}{T_g}\left(\frac{m_a+1}{m_a}\right)\right]H$$

condition for max. Discharge through chimney

velocity of hot gases through chimney

$$v = \sqrt{2gh_g} = \sqrt{2gH\left[\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right)-1\right]}$$

mass of hot gases discharged

$$m_g = AV\rho_g = A\sqrt{2gH\left(\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right)-1\right)} \times \frac{P}{RT_g}$$

Let $K = \frac{AP\sqrt{2gH}}{R}$

$$\therefore m_g = \frac{K}{T_g}\sqrt{\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right)-1}$$

for max. discharge $\frac{dm_g}{dT_g} = 0$

i.e $\frac{d}{dT_g}\left[\frac{K}{T_g}\sqrt{\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right)-1}\right] = 0$

$$\frac{d}{dT_g}\left[\frac{(ZT_g-1)^{1/2}}{T_g}\right] = 0 \qquad \left(Z = \left(\frac{m_a}{m_a+1}\right)\frac{1}{T_a}\right.$$

simplifying we get

$$ZT_g = 2$$

$$\left(\frac{m_a}{m_a+1}\right)\frac{T_g}{T_a} = 2 \quad \text{or} \quad \boxed{\frac{T_g}{T_a} = 2\left(\frac{m_a+1}{m_a}\right)}$$ condition for max discharge

The draught in mm of water for max. discharge

$$(h_w)_{max} = 353H\left[\frac{1}{T_a} - \frac{1}{T_g}\left(\frac{m_a+1}{m_a}\right)\right]$$

$$= 353H\left[\frac{1}{T_a} - \frac{1}{2T_a}\left(\frac{m_a}{m_a+1}\right)\left(\frac{m_a+1}{m_a}\right)\right]$$

$$= 353H\left[\frac{1}{T_a} - \frac{1}{2T_a}\right]$$

$$(h_w)_{max} = \frac{176.5H}{T_a} \text{ mm of water}$$

Problems on Chimney

(1) A chimney is 28 m high and temperature of hot gases inside is 320°C. The temperature of outside air is 23°C and furnace is supplied with 15 kg of air per kg of coal burnt. Calculate

(a) Draught in mm of H_2O

(b) Draught in m of hot gases

Data: $H = 28$ m, $T_g = 320 + 273 = 593$ K, $T_a = 23 + 273 = 296$ K, $m_a = 15$ kg, $h_w = ?$, $h_g = ?$

(a) Draught in mm of water

$$h_w = 353\, H \left[\frac{1}{T_a} - \left(\frac{m_a + 1}{m_a}\right)\frac{1}{T_g}\right]$$

$$= 353 \times 28 \left[\frac{1}{296} - \left(\frac{15+1}{15}\right)\frac{1}{593}\right]$$

$$= 15.6 \text{ mm of } H_2O$$

(b) Draught in m of hot gases

$$h_g = H\left[\frac{T_g}{T_a}\left(\frac{m_a}{m_a+1}\right) - 1\right]$$

$$= 28\left[\frac{593}{296}\left(\frac{15}{15+1}\right) - 1\right]$$

$$h_g = 24.6 \text{ m}$$

(2) Calculate the height of chimney to produce draft of 20 mm of water when the temperature of flue gases is 290°C and ambient temperature = 20°C. The flue gases formed per kg of fuel burnt = 23 kg

Data: $h_w = 20$ mm of H_2O, $T_g = 290 + 273 = 563$ K, $T_a = 20 + 270 = 293$ K, $m_a = 23$ kg, $H = ?$

$m_f = 23$

$$h_w = 353\, H \left[\frac{1}{T_a} - \left(\frac{m_a + 1}{m_a}\right)\frac{1}{T_g}\right]$$

$$20 = 353\, H \left[\frac{1}{293} - \left(\frac{23+1}{23}\right)\frac{1}{563}\right]$$

Ans: $H = 36.3$ m

(3) Determine the height of a chimney to produce a static draught of 15 mm of water. The temperature of gases in the chimney is 270°C and the temperature of air in the surrounding atmosphere is 20°C. Barometer reads 760 mm of Hg. The value of R for flue gases 287 Nm/kg K and for flue gases 259 Nm/kg K

Data $h_w = 15$ mm of H_2O $T_g = 270 + 273 = 543$K

$T_a = 20 + 273 = 293$K $R_{air} = 287$ Nm/Kg K

$R_{gas} = 255$ Nm/Kg K 760 mm of Hg $= 1.0132 \times 10^5$ Pa

$h_w = g H (\rho_a - \rho_g)$

$15 = 9.81 \times H (1.2 - 0.73)$

$H = 31.9$ m

$\rho_a = \frac{P}{R_a T_a}$

$= \frac{1.0132 \times 10^5}{287 \times 293} = 1.2$ Kg/m^3

$\rho_g = \frac{P}{R_g T_a} = \frac{1.0132 \times 10^5}{255 \times 543}$

$= 0.73$ Kg/m^3

(4) Aug 2002

Determine the height of chimney to get a net draught of 12mm if the total draught losses are 4mm the temperature of air is 25°C and the temperature chimney gases is 300°C The mass of air used 1Kg of fuel used is 18Kg one Kg of air occupies a volume of 0.7734 m^3 at NTP.

Data $h_w = 12 + 4 = 16$ mm of H_2O $m_a = 18$ Kg/Kg of fuel

$T_g = 300 + 273 = 573$K $V_{air} = 0.7734$ m^3/Kg

$T_a = 25 + 273 = 298$ K $H = ?$

Density of air at NTP

$\rho_{a\,NTP} = \frac{1}{V_{a\,NTP}} = \frac{1}{0.7734} = 1.293$ Kg/m^3

Density of air at 25°C (298K)

$\rho_a = \rho_{NTP} \times \frac{T_{NTP}}{T_a} = 1.293 \times \frac{273}{298} = 1.1845$ Kg/m^3

Density of hot gases at 573K

$\rho_g = \frac{1}{V_{NTP}} \times \frac{T_{NTP}}{T_g} \left(\frac{\text{Mass}}{m_a}\right)$

$= \frac{1}{0.7734} \times \frac{273}{573} \left(\frac{18+1}{18}\right)$

$\rho_g = 0.65$ Kg/m^3

New $h_w = g H (\rho_a - \rho_g)$

$16 = 9.81 \times H (1.293 - 0.65)$

$H = 29.93$ m

(5) Jan. 10

Estimate the height of chimney required to produce a static draft of 18mm of water if the mean temperature of the flue gases in the chimney is 260°C and the temperature of outside air 25°C. The densities of atmospheric air and the flue gases at NTP are 1.293 and 1.34 kg/m³ respectively.

Data: $h_w = 18mm$ of H_2O $T_g = 260+273 = 533K$

$T_a = 25+273 = 298K$ $\rho_{a_{NTP}} = 1.293 kg/m^3$

$\rho_{g_{NTP}} = 1.34 kg/m^3$ $H = ?$

W.K.T $$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{\rho_1}{\rho_1 T_1} = \frac{P_2}{\rho_2 T_2} \quad \left(V_1 = \frac{1}{\rho_1}, \; V_2 = \frac{1}{\rho_2} \right)$$

at NTP $P_{NTP} = 1.013 bar$, $T_{NTP} = 273K$

For air

$$\frac{P_a}{\rho_a T_a} = \frac{P_{NTP}}{\rho_{a_{NTP}} T_{NTP}}$$

For air and hot gases $P_a = P = 1.0132 bar$

$$\rho_a T_a = \rho_{a_{NTP}} T_{NTP}$$

$$\rho_a = \frac{\rho_{a_{NTP}} T_{NTP}}{T_a} = 1.293 \times \frac{273}{298} = 1.1845 kg/m^3$$

W.K.T for flue gases

$$\rho_g T_g = \rho_{g_{NTP}} T_{NTP}$$

$$\rho_g = \frac{\rho_{g_{NTP}} \times T_{NTP}}{T_g} = 1.34 \times \frac{273}{533} = 0.686 kg/m^3$$

Now $h_w = (g)H(\rho_a - \rho_g)$

$18 = 9.81 \times H (1.1845 - 0.686)$

$\boxed{H = 36.1m}$

(6) Determine height of the chimney used to create a draught of for a boiler in which average coal consumption is 1600 kg/h and produces flue gases of kg of coal. In the system the pressure loss is