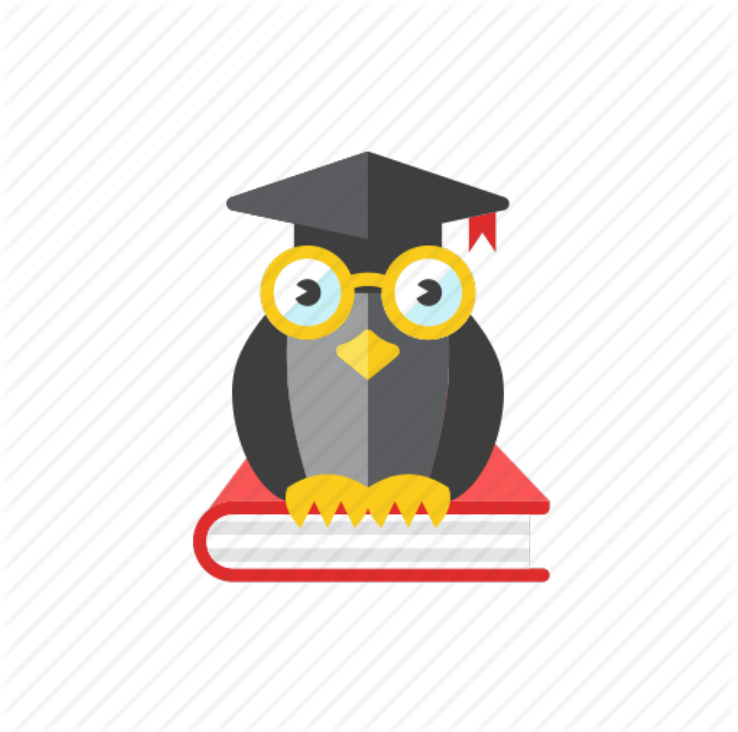
Energy Engineering Question Paper Set

VTU CAMPUS APP



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10ME53

Fifth Semester B.E. Degree Examination, June/July 2016
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. ***Use of Steam table with Molier chart permitted.***

PART – A

1 a. Explain with a neat sketch, working of multiretort stocker and their advantages. **(10 Marks)**
b. Explain pneumatic or vacuum extraction ash handling system. **(06 Marks)**
c. What are the advantages of liquid fuels used in thermal power plants? **(04 Marks)**

2 a. With a neat sketch, explain the working of Schmidt – Hartman Boiler. **(08 Marks)**
b. What are the different types of cooling ponds and cooling towers? **(08 Marks)**
c. Explain the comparisons between forced and induced draughts. **(04 Marks)**

3 a. Classify the fuel storage and supply systems used in a diesel power plant. **(08 Marks)**
b. With a neat diagram, explain the working of a diesel power plant. **(08 Marks)**
c. What are the outstanding features of a diesel power plant over thermal power plant? **(04 Marks)**

4 a. Explain water hammer and surge tanks. What are the different types of surge tanks? Brief with neat sketches. **(08 Marks)**
b. Define the term Hydrograph and Unit Hydrographs. **(06 Marks)**
c. A catchment area of the dam used for hydroelectric station is 250 km^2. The annual rainfall is 125cm. If 70% of water is used for power generation in the dam, calculate the capacity of power plant in MW. Assume that the turbine efficiency is 90% and generator efficiency is 95%. Neglect the losses. **(06 Marks)**

PART – B

5 a. With a neat sketch, explain the working of a fast breader reactor and write the advantages and disadvantages. **(08 Marks)**
b. What are the general components of nuclear reactor? **(08 Marks)**
c. Explain the terms Nuclear Fusion and Nuclear Fission reaction. **(04 Marks)**

6 a. What is Flat Plate Collector? Write a brief description of Liquid collector. **(08 Marks)**
b. Write with a neat sketch, the working of a Horizontal axial machines. **(08 Marks)**
c. Derive an expression for overall conversion efficiency and coefficient of performance in terms of velocity of blade element. **(04 Marks)**

7 a. What are the components of a tidal power plant? Brief each. **(08 Marks)**
b. A hot water geothermal plant of the total flow type receives water at 225°C. The pressure at the turbine inlet is 10.5 kg/cm^2. The plant uses a direct contact condenser that operates at 0.35 kg/cm^2. The turbine has a polytrophic efficiency of 0.65 for a cycle net output of 10MW. Calculate by using stream table and Molier chart.
(i) The hot water flow in kg/hr.
(ii) The condenser cooling water flow in kg/hr at water temperature at 27°C.
(iii) The cycle efficiency. (iv) The plant heat rate. **(08 Marks)**
c. Write the advantages and disadvantages of tidal power generation. **(04 Marks)**

8 a. Explain photosynthesis with example. **(08 Marks)**
b. With a neat diagram, explain the working of continuous and batch type Biogas plants. **(08 Marks)**
c. Write the classification of Biomass gasifiers. **(04 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, June/July 2015
Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Missing data, if any, may be suitably assumed.

PART – A

1 a. List out the different types of fuels used for steam generation. Briefly explain them. **(10 Marks)**

b. With a neat sketch, explain the working of travelling grate stroker. **(06 Marks)**

c. With a neat sketch, explain the working of cyclone burner. **(04 Marks)**

2 a. With a neat sketch, explain the working of Schmidt – Hartmann boiler. **(10 Marks)**

b. Explain with a neat sketch the working of hyperbolic cooling tower. **(05 Marks)**

c. Determine the height of chimney to get a net draught of 12 mm if the total draught losses are 4 mm. The temperature of air is 25°C and the temperature of chimney gases is 300°C. The mass of air used per kg of fuel is 18 kg. One kg of air occupies a volume of 0.7734 m^3 at NTP. **(05 Marks)**

3 a. Draw the schematic diagram of DG power plant. Mention the function of each component of the plant. **(10 Marks)**

b. Explain the different methods used for starting diesel engines. **(06 Marks)**

c. Write a note on filters used in intake system of diesel engine. **(04 Marks)**

4 a. What is a surge tank? What are its functions? List out the types of surge tanks used in hydro-electric power plant. **(06 Marks)**

b. What do you mean by water hammer? How it will be formed? **(04 Marks)**

c. The run-off data of a river at a particular site is tabulated below :

Month	Mean discharge millions of m^3/month	Month	Mean discharge millions of m^3/month
Jan	40	July	70
Feb	25	Aug	100
Mar	20	Sep	105
April	10	Oct	60
May	0	Nov	50
June	50	Dec	40

i) Draw the 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 100 m and overall efficiency of generation is 80%. **(10 Marks)**

PART – B

5 a. With a neat sketch, explain the working of Fast Breeder Reactor State its advantages and disadvantages. **(10 Marks)**

b. Write a note on :
i) Radiation hazards
ii) Radioactive waste disposal. **(10 Marks)**

6 a. What is the difference between a pyrheliometer and a pyranometer? Describe the principle of Angstrom Pyrheliometer. **(06 Marks)**

b. What is the principle of photovoltaic power generation? With a neat sketch, explain the working of photovoltaic cell. **(06 Marks)**

c. Determine extraterrestrial normal radiation and extraterrestrial radiation on a horizontal surface on February 15 at 2 pm solar time for 40° N latitude. Also determine the total solar radiation on the extraterrestrial horizontal surface for the day. **(08 Marks)**

7 a. Describe the tidal energy harnessing by "Two basin with liked basin" method. **(06 Marks)**

b. List out the problems associated with OTEC power plant. **(06 Marks)**

c. With a schematic diagram, explain the working of vapour dominated geothermal power plant. **(08 Marks)**

8 a. Clearly describe the production of oxygen from photosynthesis process. **(06 Marks)**

b. With a neat sketch, explain the working of Indian type biogas plant. **(08 Marks)**

c. With a neat sketch, explain the working of fluidized bed gasifier. **(06 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, 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.***

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 discharges (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 2013
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. What the advantages are of stokes firing? With the help of a neat diagram, explain the working of traveling Grate stokes. **(10 Marks)**

b. Sketch and explain the following pulverized fuel handling systems: i) Unit system and ii) Central or Bin system. **(10 Marks)**

2 a. Explain the Benson boiler with a neat sketch. What are its advantages? **(10 Marks)**

b. A 30 m high Chimney is used to discharge hot gases at 297°C to the atmosphere which is at 27°C. Find mass of air actually used per kg of fuel. It the draught produced in 15 mm of watts. If the coal burnt in the combustion chamber contains 80% carbon, 6% moisture and remaining ash, determine the percentage of excess air supplied. **(10 Marks)**

3 a. Draw a general layout of diesel power plant and explain all the system employed in it. **(10 Marks)**

b. Explain the important functions of lubrication system. **(04 Marks)**

c. State the application of diesel engines in power field. **(06 Marks)**

4 a. What are hydrographs? With the help of a graph, explain a unit hydrograph. Mention the limitations for its usage. **(10 Marks)**

b. With the help of a neat diagram, explain pumped storage hydro-electric power plant. What are their advantages? **(10 Marks)**

PART – B

5 a. Draw a schematic sketch of a gas cooled reactor, briefly explain its principle of working. Lists its merits and demerits. **(10 Marks)**

b. A nuclear reactor consumes 10 kg of U^{235} per day. Calculate its power output if the average energy released per U-235 fission is 200 MeV. Take Avagadro's constant = 6.02×10^{26}. **(06 Marks)**

c. Write short notes on disposal of radio active wastes. **(04 Marks)**

6 a. What is pyranometer? With a neat sketch, explain its working principle. **(08 Marks)**

b. Write short notes on the following:
i) Solar pond ii) Application of wind energy iii) Vertical type wind mill. **(12 Marks)**

7 a. Explain single basin and double basin arrangement of tidal power plants. **(08 Marks)**

b. With sketch describe the closed cycle OTEC system. Mention its advantages. **(08 Marks)**

c. What are the advantages and disadvantages of geothermal energy? **(04 Marks)**

8 a. With a neat sketch, explain the construction and working of KVIC digestor. **(08 Marks)**

b. Write a short notes on the following:
i) Photosynthesis ii) Anaerobic digestion iii) Biomass gasifier. **(12 Marks)**

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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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