

Total No. of Questions : 10]

SEAT No. :

(Total No. of Pages : 3

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**B.E. (Mechanical & Mechanical S/W)**

**ENERGY ENGINEERING**

**(2015 Pattern) (Semester - II) (402047)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

**Q1)** a) Explain any five factors that are considered for the site selection of thermal power plant. [5]

b) Write a short note on present status of power generation in India and Maharashtra. [5]

OR

**Q2)** a) What are different types of ash handling systems? Explain mechanical ash handling with neat sketch. [5]

b) With a neat sketch explain Rankine cycle with regeneration. [5]

**Q3)** a) Explain hydrograph and flow duration curve with neat sketch for hydroelectric power plant. [5]

b) Explain closed type condensing plant in brief with simple diagram. [5]

OR

**Q4)** a) What is thermal pollution from thermal power plant? Explain methods of reducing it. [5]

b) Write a note on elements of nuclear power plant. Draw a neat sketch. [5]

*P.T.O.*

**Q5)** a) Describe with neat sketches typical layout high load diesel power plant. What are advantages of diesel power plant? [8]

b) A gas turbine has a pressure ratio of 6 and the maximum cycle temperature is 900°C. The isentropic efficiencies of the compressor and turbine are 85% and 90% respectively. Air enters the compressor at 15°C at the rate of 5 kg/sec. CV of fuel used is 43,000 kJ/kg, combustion efficiency is 95%. Using  $C_{pa} = 1$  kJ/kg K,  $C_{pg} = 1.07$  kJ/kg K, and  $\gamma = 1.4$  for air and gases, find [8]

i) Air fuel ratio

ii) Thermal efficiency

OR

**Q6)** a) Explain any one arrangement of gas and steam turbine combined cycle power plant with neat sketch. State its advantages. [8]

b) A 8 cylinder four stroke diesel engine of 9 cm bore and 8 cm stroke length with compression ratio of 7 is tested at 4500 rpm. The radius of the break drum of dynamometer is 50 cm. During 10 minutes test, the dynamometer reading was 42 kg and consumed 4.4 kg of petrol having CV of 44 MJ/kg. Air of 27°C and 1 bar was supplied to carburetor at the rate of 6 kg/min. Calculate brake power, brake specific fuel consumption, brake mean effective pressure and brake thermal efficiency. [8]

**Q7)** a) Explain with neat sketch construction and working of high temperature solar thermal power plant. [6]

b) Explain with neat sketch the working of open cycle MHD generator. [6]

c) Explain any one tidal power plant with neat sketch. [6]

OR

**Q8)** a) Explain with neat sketch principle and working of binary cycle geothermal plant. [6]

b) Write note on operating characteristics of wind mill. [6]

c) Explain closed cycle OTEC with typical layout. [6]

**Q9)** a) Explain significance of [8]

i) Load factor

ii) Diversity factor

iii) Plant capacity factor

iv) Demand factor

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- b) Following data relate to a 10000 kW thermal power station. [8]

Cost of plant = Rs. 12000 /kW

Interest and depreciation = 10% per annum

Cost of coal = Rs. 400 /tonne

Operating cost = Rs.  $4 \times 10^5$  per annum

Annual salary = Rs.  $13 \times 10^5$

Plant maintenance cost (variable) = Rs. 40000 per annum

Plant maintenance cost (fixed) = Rs. 20000 per annum

Maximum demand = 9000 kW

Load factor = 60%

Consumption of coal = 25300 tonne per annum

Find:

i) Annual fixed charges per kW

ii) Annual running charges per kWh

OR

- Q10) a) Write note on [8]

i) Power Transformer

ii) Exciters

- b) The incremental fuel cost for two generation unit 1 and 2 of a power plant are given by the equation,  $dF_1 / dP_1 = 0.07 P_1 + 24$ ;  $dF_2 / dP_2 = 0.075 P_2 + 22$  Where, F is the fuel cost in rupees per hour and P is the power output in MW. [8]

Determine :

- i) The economic loading of two units when the total load supplied by the power plant is 180 kW.  
ii) The loss in fuel cost per hour if the load is equally shared by both units.

