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Question Paper Code : Q 2321

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Sixth Semester

Mechanical Engineering

ME 1354 — POWER PLANT ENGINEERING

(Common to B.E. (Part-Time) Fifth Semester Regulation 2005)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What factors should be taken into consideration while selecting the site for steam power plant?
2. What is the significance of Load curves?
3. State the characteristic of good ash handling plant.
4. What do you understand by the term 'Boiler draught'?
5. What is a nuclear fusion?
6. What do you mean by 'specific speed' of a turbine?
7. State the applications of diesel power plant.
8. What do you understand by a close cycle gas turbine power plant?
9. What are the advantages and limitations of tidal power generation?
10. What do you understand by the term tariff?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw a neat diagram of Diesel power plant and explain the essential components of the plant. (8)
- (ii) Distinguish between Hydro-power plant and Thermal power plant. (8)

Or

- (b) (i) What are the advantages of high pressure boilers? Discuss the guide lines for the selection of boilers for steam power plants. (6)
- (ii) The daily load curve for a power plant is given by the following equation

$$L = 350 + 10t - t^2$$

where t is time in hours from 0 to 24 hours and L is in MW calculate :

- (1) Value of maximum load and when it occurs, and
- (2) Load factor of the plant.

Draw load curve and load duration curve. (10)

12. (a) (i) What are the ash handling systems? Draw a line diagram of hydraulic ash handling system for modern high capacity plants. Explain its working. (10)
- (ii) Explain with the help of neat sketches the working of 'forced draft' and 'Induced draft' cooling towers. (6)

Or

- (b) (i) Explain with the help of neat sketch, the working of an electro-static precipitator and give its outstanding features over other collectors. (8)
- (ii) Explain with the help of neat diagram of Evaporative surface condenser and also explain its advantages. (8)

13. (a) (i) How are nuclear power plants classified? Explain how fission reaction takes place and how the chain reaction is controlled. (6)
- (ii) Describe with the help of a neat sketch the construction working of a Pressurized Water Reactor (PWR). What are the advantages and disadvantages? (10)

Or

- (b) (i) What is the function of surge tank in a hydro-electric plant? Explain with the help of neat diagram. (8)
- (ii) The following data is available for a hydro-power plant :
Available head = 140 m; catchment area = 2000 sq.km ,
Annual average rainfall = 145 cm; Turbine efficiency = 85%;
Generator efficiency = 90%; Percolation and evaporation losses = 16%.
Determine the following :
- (1) Power developed.
- (2) Suggest type of turbine to be used if runner speed is to be kept below 240 rpm. (8)
14. (a) (i) State and explain the factors which are required to be considered in the choice of diesel engine for a diesel power plant. (8)
- (ii) List the essential components of a Gas turbine power plant and explain them briefly. (8)
- Or
- (b) (i) What are the different fuels that are used for gas turbine power plants? What are the most suitable fuels for gas turbine plants in a country like India? Explain. (6)
- (ii) A Gas turbine unit has a pressure ratio of 6 : 1 and maximum cycle temperature of 610°C. The Isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatts of an electric generator geared to turbine when the air enters the compressor at 15°C at the rate of 16 kg/s.
Take $C_p = 1.005$ kJ/kg K and $\gamma = 1.4$ for the compression process, and take $C_p = 1.11$ kJ/kg K and $\gamma = 1.333$ for the expansion process. (10)
15. (a) (i) Explain the working of a single basin tidal power plant. (8)
- (ii) Discuss the economic loading of combined steam and hydro-plants. (8)

Or

(b) (i) Explain briefly the Block meter rate and Doherty rate. (6)

(ii) A power plant of 180 MW installed capacity has following data : (10)

Capital cost	= 120 MW
Interest and depreciation	= 12 per cent
Annual load factor	= 0.6
Annual capacity factor	= 0.5
Annual running charges	= Rs. 36×10^6
Energy consumed by power auxiliaries	= 6 per cent

Calculate :

- (1) Reserve capacity
- (2) Generation capacity.