B. Tech.
(SEM. VI) EXAMINATION. 2006-07
POWER STATION PRACTICE

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions. Each question carries equal marks.

1 Attempt any four parts of the following : 5x4=20
(a) Discuss electric energy demand and its growth in Indian power sector. List various electric energy sources.
(b) Describe the use of different parts of thermal power plant with the help of neat sketch.
(c) Explain the functions of the followings for hydropower plants:
   (i) Dam
   (ii) Spillways
   (iii) Surge tank
   (iv) Draft tube
(d) Describe different turbines and their use in hydroelectric plants.
(e) Write a note on hydro-potential in India.
(f) Classify hydroelectric plants. What factors are taken in location and site selection of this plant?

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2 Attempt any **four** parts of the following: \[ 5 \times 4 = 20 \]

(a) Explain general layout and operation of nuclear power plant. Why nuclear power stations are becoming very popular?

(b) Explain the working of gas turbine plants. What are the different types of gas turbine plants? Discuss the layout of any one of them.

(c) Explain the function of different components in diesel plant. Give its role and applications.

(d) Explain the essential factors which influence the choice of site for a nuclear power plant.

(e) Discuss the advantages and disadvantages of a gas turbine plants.

(f) Describe the working of moderator material. How disposal of nuclear waste is done? Explain role of shielding.

3 Attempt any **two** parts of the following: \[ 10 \times 2 = 20 \]

(a) Explain the different types of the substation and draw layout for the same. Give the working of each component of a substation.

(b) Explain the following: Cost of electrical energy, depreciation generation cost. Explain the effect of load factor on unit cost. What is role of load diversity in power system economy? A generating plant has a maximum capacity of 100 kW and costs Rs. 1,60,000. The fixed charges are 12% consisting of 5% interest, 5% depreciation and 2% taxes. Find the fixed charges per kWh if the load factor is (i) 100% and (ii) 50%.

(c) What are the different factors related to plants and consumer for power plant economics?

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Estimate the generating cost per kWh delivered from a generating station from the following data:
Plant capacity = 50 MW
Annual load factor = 40%
Capital cost = 1.2 crores, annual cost of wages, taxation etc. = Rs 4 lacs, cost of fuel, lubrication maintenance etc = 1.0 paise/kWh generated.
Interest 5% per annum, depreciation 6% per annum of initial value.

Attempt any two parts of the following: 10x2=20

(a) Explain the input-output characteristics of steam and hydro plants. What is its role in economic load dispatch?

A two bus system is shown in Fig 4.1. If a load of 125 MW is transmitted from plant 1 to the load, a loss of 15.625 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs. 24/MW hr. The incremental production costs of the plants are

\[
\frac{dF_1}{dP_1} = 0.025 P_1 + 15
\]

\[
\frac{dF_2}{dP_2} = 0.05 P_2 + 20
\]

![Fig. 1](image-url)
(b) Derive the incremental transmission loss formula. The fuel inputs to two plants are given by 
\[ F_1 = 0.015 \ P_1^2 + 12 \ P_1 + 50 \]
\[ F_2 = 0.025 \ P_2^2 + 12 \ P_2 + 30 \]
The loss coefficients of the system are given by \( B_{11} = 0.005 \), \( B_{12} = -0.0012 \) and \( B_{22} = 0.002 \). The load to be met is 200 MW, determine the economic operating schedule and the corresponding cost of generation if transmission line losses are coordinated.

(c) Explain hydrothermal scheduling with various power system constraints.

5 Attempt any four parts of the following: 5\times 4 = 20

(a) Write in brief about the power crisis and its remedial measures in Indian power sector.

(b) Derive the output power formula for MHD power generator. What are the different factors in MHD generation that influence the output power?

(c) Explain:
   (i) Solar energy collector
   (ii) Photovoltaic cell

(d) Describe layout of wind power generation. What are the technical problems which may arise?

(e) What are the difficulties with geothermal energy generation? Explain the layout of a small plant.

(f) Name different tidal power schemes. What is tidal barrage? Differentiate between tidal power generation and ocean thermal energy power generation.

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