B.E.(EE)PART-IV 7TH SEMESTER EXAMINATION 2011

POWER SYSTEM PLANNING

(EE-704)

Time: 3 hours Full Marks: 70

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1a) Classify power system planning activities with reference to different time horizon. Show, with the help of a block diagram, the fundamental relations of power system planning with other related activities. [2 +3]

b) State the planning process followed in a Mixed Economy. What are the different Social instruments and measures set by the Government? [2+4]

2a) State the salient points of "The Electricity(Supply)Act 1948". Explain with the help of block diagrams, the structure of Indian Power Industry before and after the implementation of **Electricity Act-2003**. [3+3]

b) State the merits and demerits of **unbundling** of power industry. Justify the formation of **Electricity Regulatory Commission** after deregulation of electricity market in India. [3+2]

3a) "Relationship between Capacity Reserve and Reliability dictates Power System Planning" – Explain.

b) Explain Capacity Resource planning. [6+5]

4a) State the importance of Bus-bar arrangement. Explain the operation of ***a Breaker and a half arrangement***. [2+3]

b) State the difference between feeder and distributor. Show that for overhead system the ratio of volume of conductor in a 2-wire DC and Single phase AC, $V_1:V_2=1:(2/\cos^2\beta)$, where $\cos\beta$ is power factor of the load.

[2+4]

5a) Calculate the voltage drop and power loss in a uniformly loaded distributor fed at both ends.

b) A 2-Km long 2-wire d.c distributor having resistance of 0.01 ohm per 1000m supplies loads of 100A,150A, 200A and 50A situated at 500m ,1000m,1600m and 2000m from the feeding point. Calculate the voltage drop at each point if the distributor feeds at one end with 1000V. [5+6]

SECOND HALF

6a) State the chief items of expenditure of an electric supply undertaking and classify the same into fixed and running charges. Explain how variation of consumer power factors can be incorporated in a two-part tariff scheme?

6b) The tariff for electricity for High Voltage industrial consumers is as follows:

Demand charge: Rs. 200/- per KW of monthly maximum demand

Unit charge: 310 paise per unit

Power factor surcharge: 200 paise per KW of monthly maximum demand for each 1 percent by which the average power factor in the month falls below 95 percent. Fuel adjustment surcharge: 150 paise per KWh at the prevailing rate.

The consumption of electricity for a consumer for the month of November 2011 is 37440 units at a load factor of 65 percent and the sinemeter advance is 28080 KVARH. Compute the electricity bill for the month with each component clearly indicated. **[5+6]**

7a) Define the terms: Demand factor, Diversity factor and Load factor. What are the disadvantages of poor load factor and diversity factor? **[3+3]**

7b) Given the following data of a power station:

i) Annual Maximum demand on-station: 100 MW

ii) Maximum demand of different types of loads supplied: 40 MW, 30 MW, 25 MW and 20 MW

iii) Average load factor of the station: 50 percent and

iv) Capacity of station: 2 units of 50 MW each and one unit of 25 MW.

Determine (a) the number of units (KWh) supplied annually (b) diversity factor and (c) utilization factor. **[5]**

8a) Explain in brief the different sources of conventional and non-conventional energy used in electricity generation. **[6]**

8b) Explain the 'principle of least squares' for fitting a straight line equation of the form $y=a + b*x$ in forecasting electrical energy. **[5]**

9a) Explain in brief the different reactive power compensating devices used in power system network. **[6]**

9b) Explain how transmission line loadability is increased by series compensation technique. Also highlight the problems associated with such compensating technique. **[5]**

10a) Explain in brief the different sources and sinks of reactive power in a power system network. **[6]**

10b) A star-connected 340 KW, 3300V, 50 Hz induction motor has full load efficiency of 85% and operates at an uncorrected p.f. of 0.8 lagging. A bank of delta-connected capacitors is used to raise the power factor to 0.96 lag. If each capacitor unit in a bank is rated 550V, 50 Hz, calculate the following:

(i) Total number of capacitor units required in each phase of the bank

(ii) Capacitance of each phase of the bank and the capacitance of each unit. **[5]**

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