BENGAL ENGINEERING AND SCIENCE UNIVERSITY,SHIBPUR

B.E. (Electrical)Part-IV 7TH Semester Examination 2012

Power System Planning

(EE 704)

Use separate answerscript for each half.

Answer SIX questions, taking THREE from each half.

Two marks are reserved for neatness in each half.

Time: 3 hour Full Marks: 70

FIRST HALF

1. a) State the aim of Power System Planning activities. Classify P.S planning activities with reference to different time horizons. What are the different uncertainties encountered in this respect by the developing countries. [1+3+1]

b) Establish the fundamental relations of different activities related to power system planning. Name different restrictions / obligations which govern planning activities. [3+3]

2 a) State the frame work of Indian Economic activity in view of power system planning. State also the planning process followed in India. "Electricity Act – 2003 urges the formation of Regulatory Commission in Power Sector"- State the reason(s). [2+3+1]

b) "Power system planning process begins with electricity load demand forecasting"– Explain. [5]

3 a) What is "ABT" ? Why and where is it applied? State its effect. [2+2+2]

b) What is "T.O.D"? Justify its application. [2+3]

4 a) Calculate the voltage drops at different points of a D.C distributor fed at one end. Assume five lumped load points. Draw current loading and voltage drop Diagram.

b) A 2-wire distributor supplied from one end has the following loads: 20 amps at 100meter; 40amps at 300meter ; 50 amps at 400meter ;and 60 amps at 500 meter from the feeding point. Find the voltages at various points if a Voltage of 500 volts be maintained at the supply end. Resistance of single Wire is 0.2Ω per 1000meter. [5+6]

5 a) Show that for over head system, the ratio of volumes of conductor in D.C, A.C Single Phase, A.C 3-ph. 4-wire, A.C 3-ph. 3-wire are $\mathbf{V_1:V_2:V_3:V_4 = 1:2/\cos^2\theta : 1/2\cos^2\theta : 1.5/\cos^2\theta}$ where $\mathbf{\cos\theta}$ is the power factor of the load.

b) Draw a neat diagram of a typical power scheme showing generation, transmission, sub- transmission, primary distribution to secondary distribution. [6+5]

SECOND HALF

6 a) How does the Capacity Reserve of a power system depend on the Reliability of its Generating Units ?

b) Explain Capacity Resource Planning methodology to match the load curve of a system. [5+6]

7 a) Define Sub-Station. State its importance in present days' context. Explain the operation of **Double breaker** bus-bar arrangement. What is meant by diameter in context of bus-bar arrangement? [1.5+1.5+2+1]

b) Explain, with a neat sketch, the operation of a bus- bar system generally used in large generating stations. Show two generators, two feeders and bus-coupler/ bus-tie bay (as applicable) . [5]

8 a) What is the role of shunt capacitors in power system operation? Explain in details how can they be utilized in power system distribution and transmission systems? [5]

b) A star connected, 400 hp, 2000 V, 50 Hz motor works at an uncorrected power factor of 0.7 lag. A bank of delta connected capacitors is used to raise the power factor to 0.9 lag. If each capacitor unit in a bank is rated 400 V, 50 Hz, calculate the total number of capacitor units required in each phase of the bank and find the capacitance of each unit. [6]

9 a) Explain how power transfer capability is increased by using series compensation.

b) What are the principal limitations of the use of shunt capacitors?

c) Explain the significance of spinning reserve in power system operation. How does it differ from quick start reserve?

d) What are the problems associated with series compensation?

e) What are the different sources and sinks of active power in a power system network? [2+2+2+2+3]

10 a) Classify electrical energy consumers on the basis of energy usage. Discuss briefly the different tariff structures framed on these consumers. [5]

b) A high voltage industrial consumer has a monthly maximum demand of 5200 kVA, 4000 kW and maintains a monthly load factor of 0.6. The kWh meter advance is 1785000 and kVArh meter advance is 1050000. The tariff rates are Rs. 1500 /kVA/month of maximum demand plus unit charge of Rs. 3.20 per unit. What will be the average rate per unit in the above case? If the consumer improves his monthly average p.f to 0.95, what will be the size of the capacitor required? For the same tariff structure, what will be the average unit rate after installation of the capacitor? [6]