



Code No. : 5424/N

FACULTY OF ENGINEERING
B.E. 2/4 (E & EE) II Semester (Main) Examination, May/June 2012
POWER SYSTEMS – I

Time: 3 Hours]

[Max. Marks : 75

Note: 1) Answer *all* questions of Part A.
2) Answer *five* questions from Part B.

PART – A

(25 Marks)

1. Define the terms : demand factor, load factor. 2
2. Discuss the importance of diversity of loads in power system. 3
3. Why do we need to think of non conventional energy sources ? 2
4. What are the advantages of hybrid power generation systems ? 2
5. Mention appropriate locations where you use pin type, suspension type, strain type, shackle type insulators. 3
6. With a neat diagram, show the various parts of a high voltage single-core cable. 3
7. What is skin effect and proximity effect ? 2
8. Explain about self-GMD and mutual-GMD. 3
9. What are the advantages of 3-wire distribution over 2-wire distribution ? 3
10. Explain the causes of low power factor of the supply system. 2

PART – B

(50 Marks)

11. a) A hydro-electric power station has a reservoir of area 2.4 square kilometers and capacity $5 \times 10^6 \text{ m}^3$. The effective head of water is 120 meters. The penstock, turbine and generation efficiencies are respectively 95% and 86%. Calculate the total electrical energy that can be generated from the power station and if a load of 15 MW has been supplied for 4 hours, find the fall in reservoir level. 4
- b) Describe with the help of a neat sketch the construction and working of a pressurized water reactor. What are its advantages and disadvantages ? 6
12. a) Describe the principle of a fuel cell. Discuss the choice of fuels and the advantages of fuel cells. 6
- b) What are the advantages and limitations of tidal power generation ? 4



13. a) A transmission tower on a level ground gives a minimum clearance of 8 meters for its lowest conductor with a sag of 10.5 m for a span of 320 m. If the same tower is to be used over a slope of 1 in 15, find the minimum ground clearance obtained for the same span, same conductor and same weather conditions. **6**
- b) Single core cable of conductor diameter 2.5 cm and lead sheath of diameter 5.3 cm is to be used on a 66 kV, 3-phase system. Two intersheaths of diameter 3.1 cm and 4.2 cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltages on the intersheaths. **4**
14. Derive an expression for the inductance per phase for a 3-phase overhead transmission line when **10**
- i) Conductors are symmetrically placed
- ii) Conductors are unsymmetrically placed but the line is completely transposed.
15. a) A system is working at its maximum kVA capacity with a lagging power factor 0.7. An anticipated increase of load can be met by one of the following two methods : **5**
- i) By raising the p.f. of the system to 0.866 by installing phase advancing equipment
- ii) By installing extra generating plant.
- If the total cost of generating plant is Rs.102 per kVA, estimate the limiting cost per kVA of phase advancing equipment to make its use more economical than the additional generating plant. Interest and depreciation charges may be assumed 10% in each case.
- b) Two systems of tariff are available for a factory working 10 hours a day for 300 working days in a year. **5**
- i) High-voltage supply at 5 paise per unit plus Rs. 5 per month per kVA of maximum demand.
- ii) Low-voltage supply Rs. 6 per unit per kVA of maximum demand plus 5.5 paise per unit.
- The factory has an average load of 200 kW at 0.8 p.f. and a maximum demand of 250 kW at the same p.f. The high voltage equipment costs Rs. 50 per kVA and the losses can be taken as 4%. Interest and depreciation charges are 12%. Calculate the difference in the annual costs between the two systems.
16. a) A 2-wire d.c. distributor AB, 900 meters long is fed at A at 440 V and loads of 50 A, 100 A and 150 A are tapped off from C, D and E which are at a distance of 200 m, 500 m and 800 m from point A respectively. The distributor is also loaded uniformly at the rate of 0.5 A/m. If the resistance of distributor per meter (go and return) is 0.0001 ohms, calculate voltage (i) at point B and ii) at Point D. **5**
- b) Derive an expression for the capacitance of a single phase overhead transmission line. **5**
17. Write short notes on the following : **10**
- i) Two-part tariff
- ii) Ring main system
- iii) Grading of capacitors