

B.E. ELECTRICAL ENGINEERING SECOND YEAR SECOND SEMESTER - 2018

Power Supply Systems

Time: Three hours

Full Marks: 100

(50 marks for each part)

Use separate answer script for each part.

PART I

Answer **any FIVE** questions.

Figures in the margin indicate full marks

1. a) Discuss the feed water and steam flow circuit with respect to steam power plant. (5+5)
b) Explain the importance of using balanced draught over other artificial draught systems.
2. Discuss the functions of (i) surge tank of hydroelectric plant (ii) draft tube of hydroelectric plant (iii) reflector of nuclear power plant (iv) starting motor of gas turbine power plant (v) deaerator of steam power plant (5x2)
3. a) Discuss the requirements of a power plant to serve as a base load plant. (3+7)
b) The variation of the load over the 24 hours of a day for a certain area is as given below.
Draw the load curve and load-duration curve:

Time	3AM-6AM	6AM-9AM	9AM – 12 noon	12 noon– 3PM	3PM-6PM	6PM-9PM	9PM– 12AM	12AM– 3AM
Load (MW)	20	40	60	60	80	120	80	40

4. a) Explain why for a gas turbine plant HP turbine may have variable speed but LP turbine must have constant speed. (4+6)
b) With a schematic diagram describe the principle of operation of an open cycle gas turbine plant.
5. Draw a neat diagram of pressurized water nuclear reactor and describe the function of each component of such reactor. (10)
6. a) Why is hydrograph important for designing hydroelectric plant? (3+7)
b) A hydroelectric power plant is supplied from reservoir having an area of 50 km² and a head of 50 m. If the overall efficiency of the plant is 60%, find the rate at which the water level of the reservoir will fall when the station is generating 30,000 kw.
7. a) Explain why thermal plants are not suitable for supplying fluctuating loads. (4+6)
b) Discuss the advantages and disadvantages of pulverized coal firing at a thermal power plant.

[Turn over

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PART-II

Answer *any three* questions from this part.

Two marks are reserved for neat and well organised answer

1. a) Compare the volume of conductor material required for three wire two phase ac system with three wire three phase ac system in overhead transmission line. 8
- b) A dc two wire distributor AB, 500m long supplies a uniformly distributed load of 0.5A/m. There are concentrated loads of 100A, 200A, 300A and 400A at 100m, 200m, 300m and 400m respectively from end A. The resistivity of conductor material is 1.7×10^{-8} ohm-m. Determine the point of minimum potential and calculate the minimum cross section of the conductors so that maximum drop may not exceed 20V. The cable is fed at 250V at both ends. 8
2. a) Mention the advantages of dc transmission over ac transmission. 4
- b) A single phase ac distributor fed at one end supplies a load of 100 A at 0.8 lagging power factor at the far end. 100A is tapped at the middle at 0.6 power factor lagging with respect to the voltage at the middle. The resistance and reactance of the distributor are 0.4ohm and 0.6 ohm respectively (go and return). Find the feeding voltage, if the far end voltage is to be kept constant at 240V. 6
- c) A single phase ac system supplies a certain power, and if this system is converted to three phase ac system by running a third similar copper conductor, calculate the additional percentage load that can be supplied for the same voltage between the conductors, and the same percentage copper loss. 6

3.	a) State and prove Kelvin's law. Explain why in practice the law is usually not strictly observed.	6
	b) Find the best current density for a three phase overhead line which is in use for 2500 hours a year. Cost of copper per kg = Rs 20, annual interest and depreciation = 12.5%. Density of copper is 8.89g/cm^3 . Resistance per conductor per km length and per sq. cm = 0.173 ohm. Cost of energy per unit = 16 paise.	6
	c) Why is loop arrangement better than radial arrangement in distribution systems?	4
4.	a) Describe high rupturing capacity cartridge fuse.	4
	b) What is a substation? Classify substations according to the service features.	6
	c) Mention the general stipulations which are to be followed in any house wiring scheme.	6
5.	a) What do you understand by current transformer and potential transformer?	6
	b) Discuss the main and transfer bus bar arrangement in a substation.	6
	c) Mention the stipulations to be followed for pipe and plate earthing.	4