

B.E. ELECTRICAL ENGINEERING SECOND YEAR SECOND SEMESTER - 2022

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 three** questions.

Answer Question number 1 and any two from the rest.

Discuss about the following (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 (vi) waste management in nuclear power plant (6×3=18)

a) Discuss the feed water and steam flow circuit with respect to steam power plant with the help of a suitable schematic diagram. (5+5+6=16)

b) Explain the importance of using balanced draught over other artificial draught systems.

c) Draw a neat diagram of pressurized water nuclear reactor and describe the function of each component of such reactor

(a) How many lubricating oil pumps used in steam power plant? Discuss about each of them in brief. (8+4+4=16)

(b) A 120 MW steam station uses coal of calorific values 6400 kcal/kg. Thermal efficiency of the station is 30% and electrical efficiency is 92%. Calculate the coal consumption per hr. when the station is delivering its rated full load.

(c) Discuss about air preheater used in steam power plant.

a) What is hydrograph? Discuss different type of hydrograph also mention how does it help in designing and planning of hydro-electric power projects? (5+8+3=16)

b) Write a comparative study among pelton wheel, Francis turbine and Kaplan turbine.

c) What are the factors to be considered in site selection of hydroelectric power plant?

a) What do you understand by the term 'turbo-alternator'? (2+4+10=16)

b) Differentiate between high head and low head hydroelectric plants.

c) With a schematic diagram, describe the principle of operation of a closed cycle gas turbine plant. Point out the merits of closed cycle gas turbine plant over open cycle gas turbine plant

[Turn over

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PART – II**Answer any five of the following questions.**

1. Compare the volume of conductor material required for dc three wire system with ac two phase three wire system in underground cables. State the assumptions. 7+3

2. State Kelvin's law. Applying Kelvin's law determine the most economic cross section for the conductor of a three phase, 33kV, 8km overhead line. The line supplies a load of 2500kW for 8hours a day, 1500kW for 10hours a day and 1000kW for 6 hours a day, all at unity power factor. The line is used for all 365 days in the year. The line cost is considered as Rs.(16250+5000a) per km length where a is the area of cross section cm^2 . The resistance of the conductor of length 1 km and area 1 cm^2 is 0.176 ohms. Energy cost is 5 paise per kWh. Interest and depreciation charges are 8%. 2+8

3. i) What do you understand by "23/0.3" PVC cable"? 2
 ii) A 50km, 33kV three phase three wire line supplies a balanced load of 6MW at 0.8 pf lagging. If the transmission efficiency is 80% determine the weight of copper required. What reduction in weight of copper can be obtained in case of single phase two wire ac line operating at the same voltage between lines? Assume specific resistance of copper as $1.73 \times 10^{-8} \Omega\text{m}$ and density as 8900kg/m^3 . 8

4. Define prospective current and pre-arcing time in a fuse. Explain what you understand by feeders, distributors and service mains. 4+6

5. i) Derive an expression for the power loss in a uniformly loaded distributor fed at both ends with equal voltages. 4
- ii) A dc two wire distributor AB, 300m long supplies a uniformly distributed load of 0.25A/m. There are concentrated loads of 40A and 60A at P and Q respectively. The distances of AP and BQ are 120m each. The loop resistance of the distributor is $0.001\Omega/m$. Determine the currents fed at A and B and voltages at point P and Q. Both A and B are maintained at 300V. 6
6. i) What do you understand by earthing? Mention the factors on which earth resistance depends. 5
- ii) Explain the operation of protective relays in power system 5
7. i) What do you understand by stranded conductor? What are its advantages? 5
- ii) Write short note on ACSR conductor. 5