

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024

(2nd Year, 1st Semester)

POWER SUPPLY SYSTEMS

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-I**Answer any three questions***(Two marks are reserved for neatness and well organized answers)*

1. a) State and prove Kelvin's law. State the limitations of Kelvin's law. 2+3+3
- b) A two conductor cable one km long, is required to supply a constant load of 155A throughout the year. The cost of the cable is Rs. $(125a+60)/m$, where 'a' is the area of X-section of the conductor in cm^2 . The cost of energy is 35 P/kWh and interest and depreciation charges amount to 14%. Specific resistivity of the conductor is $1.75\mu\Omega cm$. Find the most economical cross section of the cable. 8
2. a) Classify substations on the basis of service rendered and briefly explain each type. 10
- b) Give a comparison between outdoor substation and indoor substation. 6
3. a) Derive an expression for the power loss in an uniformly loaded distributor fed at both ends with equal voltages. 8
- b) A 800 metres 2-wire d.c. distributor AB fed from both ends is uniformly loaded at the rate of 1.25 A/metre run. Calculate the voltage at the feeding points A and B if the minimum potential of 220 V occurs at point C at a distance of 450 metres from the end A. Resistance of each conductor is $0.05 \Omega/km$. 8
4. a) Compare the conductor weighing for a.c. three phase, four wire system and d.c. two wire system in overhead transmission line for the same line voltages and same losses in both the cases. 8
- b) What are the different types of bus-bar arrangements used in substations? Describe main and transfer bus-bar arrangement with suitable diagrams. 8
5. a) Define the following terms related to fuses of an electrical circuits:
Current rating of the fuse element, fusing current, fusing factor, Prospective Current, Cut-off current, Pre-arcing current, Arcing time, Breaking capacity. 8

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- b) A fuse wire of circular cross-section has a radius of 0.9 mm. The wire blows off at a current of 10A. Calculate the radius of the wire that will blow off at a current of 2A. 3
- c) Briefly explain the construction of smooth body ACSR conductor 5
6. Write short notes on the following: 2×8
- a) Plate Earthing or Pipe Earthing
 - b) Tee System Wiring or Looping System

Bachelor of Engineering (Electrical Engineering) Second Year First Semester Examination-2024**SUBJECT : POWER SUPPLY SYSTEMS****Full Marks -100****Time : Three hours****Use a separate Answer-Script for each part**

No. of question	<u>Part II (50 Marks)</u> <u>Answer any three questions (Question no. 1 carries 18 marks)</u>	Marks
1. a)	Discuss the function of the following items with respect to steam power plants: (i) Air preheater (ii) Economiser (iii) Draught fans (iv) Super heater (v) ESP	2×5
b)	Distinguish between peak load plant and base load plant. Discuss the requirement for a power plant to serve as a peak load plant. Is it possible to operate a nuclear plant as a peak load power plant?	3+3+2
2. a)	The percentage composition by mass of a sample of coal is C=67.35%, H ₂ =26.26%, O ₂ =2.28%, N ₂ =0.57%, and S =1.37%, the remaining being ash. Calculate the minimum weight of air required for complete combustion of 1 kg of this coal.	8
b)	Distinguish between water-tube and fire-tube boilers and discuss the chief advantages of water tube boilers over fire tube boilers.	8
3.a)	What are the different methods for the classification of hydroelectric power plants?	8
b)	What do you understand by run-off-river plant? Draw a schematic diagram of such a plant.	8
4. a)	Explain the following terms with reference to a nuclear reactor: (i) Moderator (ii) coolant (iii) control rods (iv) reflector	2×4
b)	With the help of a neat sketch, describe the workings of a pressurized water reactor(PWR) used in a nuclear power plant.	8
5. a)	Draw the schematic diagram of a closed cycle gas turbine and then discuss how it works.	8
b)	Discuss the advantages and disadvantages of gas turbine plants in comparison to other plants.	8