

**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024**

(2nd Year, 1st Semester, Supplementary)

**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 150A throughout the year. The cost of the cable is Rs.  $(120a+50)/m$ , where 'a' is the area of cross section of the conductor in  $cm^2$ . The cost of energy is 25 P/kWh and interest and depreciation charges amount to 12%. Specific resistivity of the conductor is  $1.73\mu\Omega cm$ . Find the most economical cross section of the cable. 8
2. a) Mention the basic requirements for installing a substation. 5  
b) Classify substations on the basis of constructional features and briefly explain each type. 11
3. a) Determine the expression for voltage drop in a uniformly loaded d.c. distributor fed at both ends with equal voltages. Draw the current loading and voltage drop diagrams. 8  
b) Calculate the voltage at a distance of 200 m of a 300 m long distributor uniformly loaded at the rate of 0.75 A per metre. The distributor is fed at one end at 250 V. The resistance of the distributor (go and return) per metre is  $0.00018 \Omega$ . Also find the power loss in the distributor. 8
4. a) Compare the conductor weighing for a.c. single phase, two-wire system with one conductor earthed and d.c. three 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 a single bus-bar system with sectionalization arrangement accompanied by 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 0.8 mm. The wire blows off at a current of 8A. Calculate the radius of the wire that will blow off at a current of 3A. 3
- c) Briefly explain the construction of expanded ACSR conductor 5
6. Write short notes on the following: 2×8
- a) Pipe Earthing
- b) Tee System Wiring

**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) SECOND YEAR FIRST SEMESTER  
SUPPLEMENTARY EXAMINATION - 2024**

**Subject: POWER SUPPLY SYSTEMS**

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Full Marks: 100

Part-II

(50 Marks for part-I)

Use separate answer-Script for each part

Question no.	<i>Answer question no. 1 and any two from the rest</i>	Marks
<b>1.</b>	<i>Write short notes on any six</i>	<b>6×3</b>
i)	Overall efficiency of steam power plant	
ii)	Spillway of hydroelectric power plant	
iii)	Penstock of hydroelectric power plant	
iv)	Draft tubes of hydroelectric power plant	
v)	Control rods of nuclear reactor	
vi)	Coolant of nuclear reactor	
vii)	ESP in steam power plant	
viii)	Economizer in steam power plant	
ix)	Air preheater in steam power plant	
x)	Superheater in steam power plant	
<b>2.</b>	a) Explain the principle of fire tube and water tube boilers.	<b>8+8</b>
	b) What are the different methods of classification of hydroelectric power plant?	
<b>3.</b>	a) A sample of coal has the following molal analysis C 67.35%, H <sub>2</sub> 26.26%, O <sub>2</sub> 2.28%, N <sub>2</sub> 0.57%, S 1.37%, H <sub>2</sub> O 2.17%. Write the complete combustion equation in stoichiometric air and calculate the coal ultimate analysis, mass percent.	<b>8+8</b>
	b) Discuss the advantages and disadvantages of pulverized coal firing at a thermal power plant.	

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4. a) What is nuclear fission? Explain how electricity is generated in nuclear power plant. **10+6**  
b) What are the characteristics of base load and peak load plants?
5. a) Draw and explain the schematic diagram for an open cycle gas turbine with improvement in efficiency. **10+6**  
b) Discuss the principle of operation of a pumped storage power plant.