

Code No: **R4102A**

**R10**

**Set No. 1**

**IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015**

**ELECTRICAL DISTRIBUTION SYSTEMS**

**(Electrical and Electronics Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions  
All Questions carry equal marks**

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- 1 a) Explain how the load growth in a distribution system can be obtained. [8]  
b) A distribution substation experiences an annual peak load of 3,500 kW. The total annual energy supplied to the primary feeder circuits is 107 kWh. Find i). the annual average power ii). the annual load factor [7]
- 2 a) Explain basic design practice of secondary distribution system and also discuss about secondary banking. [7]  
b) Draw the one line diagram of radial type primary feeder and mention the factors that influence the selection of primary feeder. [8]
- 3 a) Explain the classification of substations according to design. [7]  
b) What are the advantages and disadvantages of outdoor substation as compared to indoor substation? [8]
- 4 a) Derive the expression for power loss and voltage drop for a non-uniformly distributed load. [8]  
b) A single-phase feeder circuit has a total impedance of  $(3+j6)$ , receiving voltage is 220V and current is  $10 \angle -45^\circ$  A. Determine the power factor of the load and load power factor for which impedance angle is maximum. [7]
- 5 a) What are the objectives of distribution system protection? [8]  
b) What are the advantages and disadvantages of fuses? [7]
- 6 a) Explain the primary and secondary objectives of distribution system protection. [7]  
b) Explain the different types of common faults that occur in an overhead distribution system. [8]
- 7 a) Explain the necessity of power factor control and how it can be achieved through capacitive compensation. [7]  
b) A single phase system supplies the following loads. [8]  
i) Light load of 25 kW at unity power factor.  
ii) Induction motor load of 125 kW at p.f 0.707 lagging.  
iii) Synchronous motor load of 75 kW at p.f 0.9 leading.  
Determine the total kW and kVA delivered system and p.f at which it works.
- 8 a) What are different methods for voltage control? Briefly explain them. [8]  
b) Explain the basic functions of booster transformer and how it increases the line voltage. [7]

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**Time: 3 hours**

**Max. Marks: 75**

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- 1 Explain the classification of different loads along with their characteristics. [15]
- 2 a) Classify different types of primary feeders and give their merits and demerits [8]  
b) Assume that feeder has a length of 3 Km and that the new feeder uniform loading has increased to 3 times the old feeder loading. Determine the new maximum length of the feeder with the same percent voltage drop if the new feeder voltage level is increased to 34.5kV from the previous voltage level of 12.47kV. [7]
- 3 Explain the perpendicular Bisector rule method and X-Y co-ordinate method for optimal location of substation. [15]
- 4 Derive an approximate voltage drop & power loss equation of primary feeder and give the condition for load p.f. at which voltage drop is maximum. [15]
- 5 a) Explain the principle of operation of circuit Re closure. [7]  
b) Explain the operation of a Line sectionalizer and fuse. [8]
- 6 a) Explain Recloser- Circuit breaker coordination procedure in distribution system protection. [8]  
b) What is a protective device? Explain their objectives. [7]
- 7 a) Write notes on need for maintaining good voltage profile in power systems and need to improve power factor. [5]  
b) A 3-phase substation transformer has a name plate rating of 7250 kVA and a thermal capability of 120% of the name plate rating. If the connected load is 8816 kVA with a 0.85pf lagging, determine the following:  
i) The kVAR rating of the shunt capacitor bank required to decrease the kVA load of the transformer to its capability level.  
ii) The power factor of the corrected level. [10]
- 8 a) Explain the importance of voltage control and the different methods adopted for the voltage control. [7]  
b) Explain different types of equipment needed for voltage control with neat diagrams. [8]

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**Set No. 3**

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**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions  
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- 1 Explain how the loads are classified in distribution systems and how they are classified? Also explain their different characteristics. [15]
- 2 a) Compare the radial and loop type primary feeders. [7]  
b) Explain the various selection factors that influence the design and operation of primary feeders. [8]
- 3 How do you analyse a substation service area with 'n' primary feeders. [15]
- 4 a) Derive the approximate voltage drop and power loss equation of primary feeders of a non-uniformly distributed loads. [7]  
b) A single phase feeder circuit has total impedance  $(0.5 + j 0.2) \Omega$ ,  $V_r = 230V$  and  $I_r = 5 \angle -30^\circ A$ . Determine:  
i) Power factor of load  
ii) Load P.f for which impedance angle in maximum and [8]  
iii) Find and derive the expression for load p.f for which the drop in maximum.
- 5 Describe the principle of operation of:  
a) fuses  
b) Circuit breakers  
c) Line sectionalizer  
d) Circuit recloser. [15]
- 6 a) Explain the salient points in general co-ordination procedure in an electrical distribution system. [8]  
b) Explain Recloser -Recloser coordination. [7]
- 7 a) Explain the economic justification of installing a capacitor in distribution system. [8]  
b) Explain shunt capacitors compensation [7]
- 8 a) Explain the various ways to improve the overall voltage regulation in a Distribution system. [7]  
b) Write short notes on any two methods of voltage control? [8]

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- 1 a) Define the following terms:  
i) Diversity factor ii) Coincidence factor iii) Utilization factor iv) Loss factor [8]  
b) A load of 100 kW is connected at the riverside substation. The 15 min weekly maximum demand is given by 75 kW and the weekly energy consumption is 4200 kWh. Find the demand factor, the 15 min weekly load factor of the substation and its associate loss factor [7]
- 2 a) Discuss the various loading and voltage level factors that influence the design and operation of primary feeders. [8]  
b) Explain the various types of radial primary feeders with diagrams. [7]
- 3 a) Explain the various factors to be considered to decide the ideal location of substation. [8]  
b) Compare and contrast between square shaped and hexagonal shaped distribution substation areas. [7]
- 4 a) Discuss the importance of voltage drop and power loss calculations in distribution system. [8]  
b) Prove that the power loss due to load currents in the conductors of the single phase two wire ungrounded lateral with full capacity neutral is 6 times larger than the one in the equivalent three phase 4 wire lateral. [7]
- 5 Obtain the sequence impedance computed for a L-L, 2L-G and L-G faults. Compare the magnitude of fault current in all cases. [15]
- 6 a) Explain the coordination procedure between two fuses. [8]  
b) Explain Fuse-Recloser coordination in a distribution system. [7]
- 7 a) Compare and explain role of shunt and series capacitors in power factor correction. [8]  
b) A 400V, 50cycles 3-phase line delivers 207KW at 0.8 P.f lag. It is desired to bring the line P.F to unity by installing shunt capacitors. Calculate the capacitance if they are i) star connected and ii) delta connected. [7]
- 8 a) Explain how an AVB controls the voltage with a neat diagram [8]  
b) Explain the role of series capacitor in voltage control. [7]