

**IV B.Tech I Semester Regular Examinations, November 2005**  
**ELECTRICAL DISTRIBUTION SYSTEMS**  
**(Electrical & Electronic Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

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1. Discuss the objectives of distribution system planning. [16]
2. (a) Explain briefly the classification of Loads. [4]  
 (b) A power supply is having the following loads.

Type of load	Maximum demand in kW	Diversity of group	Demand factor
Domestic	1,500	1.2	0.8
Commercial	2,00	1.1	0.8
Industrial	10,000	1.25	1.0

If the overall system diversity factor is 1.35, determine

- (a) maximum demand [6]
- (b) connected load of each type [6]
3. Draw the one line diagram of radial type primary feeder and mention the factors that influences the selection of primary feeder. [6+10]
4. How do you analyse a substation service area with 'n' primary feeders. [16]
5. Consider the single phase radial distributor shown in the following figure 1

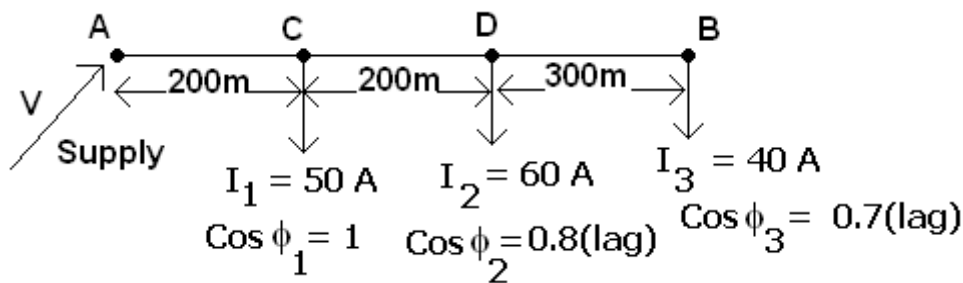


Figure 1:

the magnitude of load currents, p.f.s and distances are indicated in the figure. The resistance and reactance of each wire are 0.1 ohm and 0.2ohms per km respectively. It is required to maintain voltage at point B as  $230\angle 0^\circ$ Volts, find

- (a) voltage drop in the three sections
- (b) total voltage drop in the feeder

- (c) supply voltage, current and power factor
- (d) KVA output of supply  
The p.f. angles of individual loads are w.r.t. voltage at point B. [4x4=16]
6. (a) Explain the principle of operation of fuse. [6]  
(b) Explain the coordination procedure between Reclosure and fuse. [10]
7. (a) Write notes on how an over excited synchronous machine improves power factor? [8]  
(b) A feeder supplies an industrial consumer with a cumulative load of
- i. Induction Motors totaling 300HP which runs at an average efficiency of 89% and lagging average p.f. of 0.85
  - ii. Synchronous Motors totaling 100HP with an average efficiency of 86% and
  - iii. a heating load of 100KW. The industrial consumer plans to use the synchronous motors to correct its overall p.f. Determine the required p.f. of the synchronous motors to correct the overall p.f. at peak load to
- A. unity  
B. 0.96 lagging. [4+4=8]
8. (a) Write short notes on any two methods of voltage control? [3+3=6]  
(b) "Voltage control and p.f. correction why these are necessary in power systems? What are the disadvantages of low voltage and low p.f. of the system? [5+3+2]

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1. Discuss the objectives of distribution system planning. [16]
2. (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  $10^7$  kWh. Find
  - i. the annual average power [4]
  - ii. the annual load factor [4]
3. What are the various factors that are to be considered in selecting a primary feeder rating? Describe the arrangement with suitable diagram. [6+6+4]
4. How do you analyse a substation service area with 'n' primary feeders. [16]
5. (a) Prove the power loss due to load currents in the conductors of the two-phase, three wire lateral with multi grounded neutral is approximately 1.64 times larger than the one in the equivalent three phase lateral. [6]  
 (b) Consider the three phase, three wire 240V secondary system with balanced loads at A, B and C as shown in figure1. Determine
  - i. the total voltage drop in one phase of lateral
  - ii. the real power per phase for each load
  - iii. the reactive power per phase for each load and
  - iv. the KVA output and load p.f. of the distribution transformer. [2+2+2+2+2]

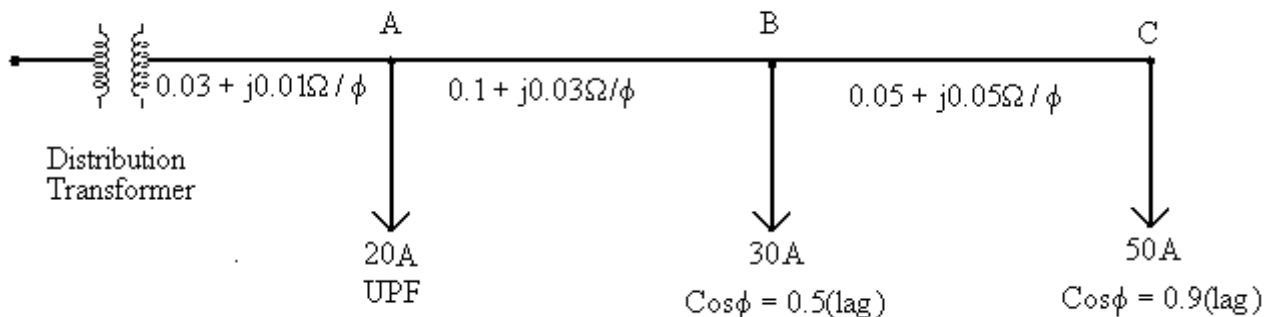


Figure 1:

6. (a) What are the types of common faults that occur in a distribution system? Explain them with proper line diagram. [4+4=8]

- (b) Considering a typical example, describe the procedure for fault current calculations in a distribution system, mentioning the assumptions to be made for the analysis. [5+3=8]
7. (a) Compare and explain the role of shunt and series capacitors in P.F. correction. [5+5=10]
- (b) A 400V, 50 cycles three phase line delivers 207KW at 0.8p.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 [3]
  - ii. delta connected. [3]
8. (a) Briefly explain the line drop compensation on voltage control. [6]
- (b) How an AVB can control voltage? With the aid of suitable diagram explain its function. [5+5=10]

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1. Discuss the objectives of distribution system planning. [16]
2. (a) Explain the characteristics of different types of Load models. [6]  
(b) Assume that the annual peak load of a primary feeder is 2,000 kW, at which the power is 80kW per three phase. Assuming an annual loss factor of 0.15, determine
  - i. the average annual power loss [5]
  - ii. the total annual energy loss due to the copper losses of the feeder. [5]
3. Explain various types of radial primary feeders with diagrams. [8+8]
4. How do you analyse a substation service area with 'n' primary feeders. [16]
5. (a) Prove the power loss due to the load currents in the conductors of single-phase lateral ungrounded neutral case is 2 times large than one in the equivalent three phase lateral. [8]  
(b) Prove 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. [8]
6. (a) What are the main objectives of distribution protection? Discuss. [4+6]  
(b) The per unit values of positive, negative and zero sequence reactances of a network at fault are 0.08, 0.07 and 0.05 respectively. Determine the fault current if the fault is double line to ground. [6]
7. (a) Explain the computerized method to determine the economic power factor. [6]  
(b) A feeder supplies an Industrial consumer with a cumulative load of
  - i. Induction Motors totaling 200HP which runs at an average efficiency of 89% and a lagging average p.f. of 0.85.
  - ii. Synchronous motors totaling 100HP with an average efficiency of 85% and
  - iii. a heating load of 100KW. The Industrial consumer plans to use the synchronous motors to correct its overall power factor. Determine the required p.f. of the synchronous motors to correct the overall p.f. at peak load to
    - A. unity
    - B. 0.95 lag. [5+5=10]

8. (a) Why we need to control the voltage of power system? Explain in detail. [8]  
(b) Compare and explain the role of shunt and series capacitor in voltage control. [4+4]

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1. Explain the various factors affecting the distribution system planning. [16]
2. (a) Discuss the effect of load factor and diversity factor on the cost of generation in a power system. [4+4]  
 (b) Assume that the annual peak-load input to a primary feeder is 2000 kW. The total copper loss at the time of peak-load is 100 kW. The total annual energy supplied to the sending end of the feeder is  $5.61 \times 10^6 \text{ kWh}$ . Determine
  - i. the annual loss factor [4]
  - ii. the total annual copper loss energy and its value at Rs.1.5 per kWh. [4]
3. Derive the equations for voltage drop and power loss in a radial feeder with uniformly distributed load. [8+8]
4. (a) What are the various factors that are to be considered in selecting substation location. [6]  
 (b) Compare the four and six feeders patterns. [5+5=10]
5. Consider the single phase radial distributor shown in the following figure 1

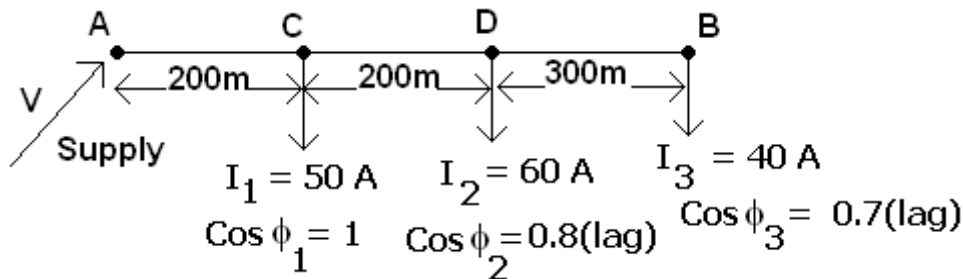


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the magnitude of load currents, p.fs and distances are indicated in the figure. The resistance and reactance of each wire are 0.1 ohm and 0.2ohms per km respectively. It is required to maintain voltage at point B as  $230\angle 0^\circ$ Volts, find

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6. (a) What are the types of common faults that occur in a distribution system?  
Explain them with proper line diagram. [4+4=8]
- (b) Considering a typical example, describe the procedure for fault current calculations in a distribution system, mentioning the assumptions to be made for the analysis. [5+3=8]
7. A 3-phase transformer rated 7000KVA and has a over load capability of 125% of the rating. If the connected load is 1150KVA with a 0.8 pf (lag), determine the following :
- (a) The KVAR rating of shunt capacitor bank required to decrease the KVA load of the transformer to its capability level,
- (b) the p.f. of the corrected level,
- (c) the KVAR rating of the shunt capacitor bank required to correct the load p.f. to unity. [6+4+6]
8. (a) How do the shunt capacitor and reactors control the voltage? List the disadvantages of using a shunt capacitor for voltage control. [3+3+4]
- (b) With the help of a phasor diagram, show how a series capacitor boosts the voltage? What are the drawbacks of this method? [4+2]

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