B.E. Eighth Semester (Electrical Engineering (Electronics & Power)) (C.B.S.)

Elective - III : Electrical Distribution System

P. Pages : 3

Time : Three Hours

KNT/KW/16/7578

Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.

1. a) Derive the relation between load factor and loss factor. **6**

b) Discuss the following terms : **7**

i) Diversity factor
ii) Coincidence factor
iii) Contribution factor
iv) Load Diversity

OR

2. a) Assume that there are six residential customers connected to a distribution transformer. Connected load is 9KW per house and demand factor and diversity factor for group of six houses is 0.65 and 1.1 respectively. Determine diversified demand of group of six houses on distribution transformer. **6**

b) Discuss in detail the classification of loads with their characteristics. **7**

3. a) Derive the relation for voltage drop and power loss for the feeder with uniformly distributed load of i amp. per unit length. **7**

b) Industrial area near a city was found to have a load density $0.5\ \text{MVA}/\text{km}^2$. The total area was to be located between a rectangular strip of $8\,\text{km} \times 4\,\text{km}$. Determine suitable number of $33/11-\text{kV}$ substations, their capacity and feeder length. The loads are served by 11 kV feeders. If the feeder chosen has resistance of $0.93\Omega/\text{km}$ and inductance of $0.33\,\text{H}/\text{km}$, what is voltage drop. Assume uniformly distributed load with 0.85 lag. pf. **7**

OR

4. a) What is primary feeder loading. Discuss the factors affecting the design loading of feeder. **7**

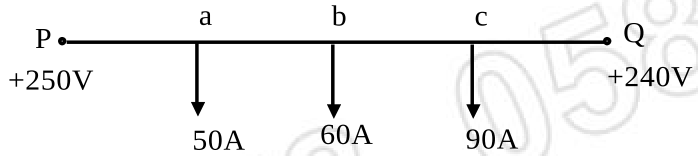
b) Discuss the following : **7**

i) Radial type feeders with tie and sectionalizing switches.

ii) Radial feeder with express feeder and back feed

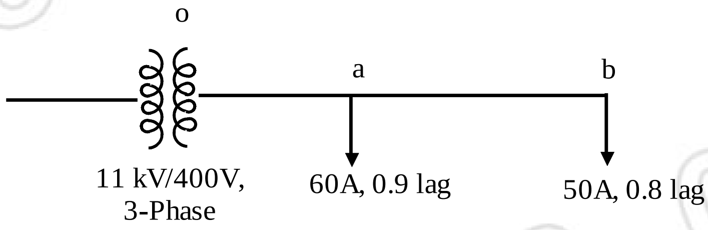
iii) Loop type primary feeder.

5. a) In the figure shown, determine the voltage drop and minimum voltage point if point Q is at + 240 V. **7**



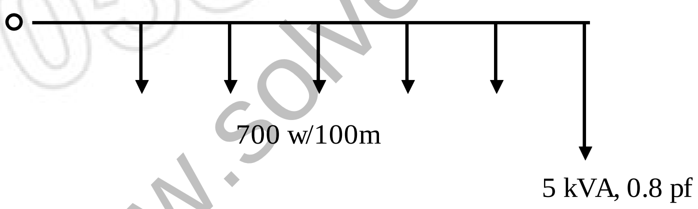
The distances are Pa = 50m, Pb = 200m, Pc = 600m, PQ = 1 km.

b) A 400 kV, 3 - phase, 4 - wire system has balanced loads and is fed from a 11kV/400V, 3 - Phase, 100 kVA transformer. Determine voltage drop, output kVA, KW and pf of transformer. The impedances are section 0a=(0.06 + j0.04) Ω, section ab=(0.1+j 0.05) Ω. **7**



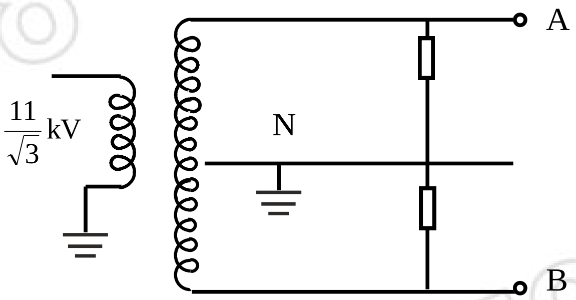
OR

6. a) A 1 – phase, 230 V, line has a uniform loading of 700W/100m and one load of 5 kVA, at 0.8 pf lag as shown in figure. Determine the voltage drop and voltage at the end of line. Impedance of line per 100 m length is (0.14 + j 0.105) Ω and total length of line is 1 km. **7**



b) A $\frac{11}{\sqrt{3}}$ kV $\big/$ 240 – 0 – 240 V transformer of 20 kVA capacity and 10% reactance supplies the following single – phase loads. A L – G fault occurs on line AN. Determine the fault current referred to primary side and fault MVA. Impedance of each line is j0.01 Ω and fault occurs after the load. **7**

Load AN = 8 kVA, upf
Load BN = 8 kVA, upf
Fault impedance = j2 Ω



7\. a) Explain ON – LOAD tap changer in detail. **6**

b) An induction motor takes 50 KW at 0.76 pf lag. from a 400 V, 3 – phase supply. It is needed to improve the pf to 0.9. Determine the kVAR of capacitor bank needed. **7**

If this capacitor bank has 5% losses on its capacity, what is the total power taken and the actual pf after capacitor connection. What will be the % reduction in line current and power losses.

OR

8\. a) Discuss the benefits with capacitor installation in distribution system. **5**

b) A power system has 15,000 kVA capacity operating at 0.65 pf lag and cost of capacitor to correct the pf is Rs. $1000/\text{kVA}_r$, determine the cost involved to increase the pf to (i) 0.85 lag (ii) 0.95 lag. (iii) unity. **8**

Also develop a table showing required reactive power to increase the pf at 0.05 intervals.

9\. a) Explain the need for distribution automation. **6**

b) Enumerate the functions of distribution automation. **7**

OR

10\. a) Define SCADA and its objectives. **6**

b) Discuss the components of SCADA. **7**

11\. a) Give the arrangement of a single transformer 11,000/415 V substation and its layout. **6**

b) Discuss bus arrangement and switching systems in substations. **7**

OR

12\. a) Why is grounding needed? How is system grounding done? **6**

b) Give the different components of GIS with brief description. **7**

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