

**Electrical Installation Design**

P. Pages : 3

Time : Three Hours



**NKT/KS/17/7466**

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.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Explain Demand factor, Diversity factor and load factor and give their typical values for different category of load. **5**
- b) A power supply is having the following loads. **5**
- |                          |            |
|--------------------------|------------|
| Industrial consumer      | = 1500 kW. |
| Commercial establishment | = 750 kW.  |
| Domestic power           | = 100 kW.  |
| Domestic light           | = 450 kW.  |
- At the maximum demand on the station is 2500kW and the number of kWh generated per year is  $45 \times 10^5$ , determine.
- i) The Diversity Factor.
  - ii) Annual load factor.
- c) What is maximum demand? **4**
- OR**
2. a) What do you understand by time of day (TOD) based tariff? Discuss how TOD tariff can be utilized by a consumer for reducing cost of electrical energy. **7**
- b) Explain various factors important for selection of cable for any electrical power distribution. **7**
3. a) Explain the difference between fuse and circuit breaker. **4**
- b) Write short note on earth leakage circuit breakers. **5**
- c) Write notes on contactor. **4**

**OR**

4. a) The section bus-bars A and B are linked by a bus-bar reactor rated at 5,000 kVA with 10% reactance. On bus-bar A there are two generators each of 10,000 kVA with 15% reactance and on B two generators each of 8000kVA with 10% reactance. Find the steady MVA fed into a dead short circuit between all phases on B with bus-bar reactor in circuit. **7**
- b) Explain various locations of reactors in power system. **6**
5. a) Explain and draw the speed torque characteristics for DOL and star-delta starting of Induction motor. **6**
- b) Calculate value of capacitor bank to improve the P.F. to 0.99 and payback period for load of. **7**
- i) 5 number of motors of 20kW, 90% efficiency 0.85 (lag) P.F.
- ii) 4 number of motors of 50kW, 85% efficiency 0.9 (lag) P.F.
- iii) Lighting load 10kW, 0.9 P.F.  
The load is connected for 24 Hrs per day. The electricity charges are Rs. 10/kWh and demand charges are Rs. 200/kVA. The capacitor is star connected, 415V. capacitor cost is Rs. 60/kVAR.

**OR**

6. a) Draw the control and power circuit for star-delta starter and explain its operation. **6**
- b) A 415V, 50Hz, 200HP delta connected Induction motor has an efficiency of 90% and power factor of 0.85 (lag) at full load. **7**
- i) Determine the rating of capacitors required to improve the P.F. to 0.99 (lag).
- ii) If the cost of installation of capacitors is Rs. 400/-per KVAR and the energy, charge are Rs. 6/- per kWh, find the annual saving due to reduction in cable losses and the payback period for capacitor installation cost. Assume that motor runs for 500Hrs per month and the supply cable resistance is 0.05 ohm per ph.
7. a) Discuss the importance of neutral earthing. List the various methods. **6**
- b) Explain various pre-commissioning test on power transformer. **7**

**OR**

8. a) Give list of accessories for a power transformer. Explain in brief the function of OTI, and breather. **6**
- b) Explain the construction and working of Buchholz relay. **7**
9. a) How Insulation resistance test and continuity test is performed using megger. **7**

- b) An industrial installation is divided in two load areas A and B. The low tension loads are as under. 7  
Area A : 100 Hp 3-ph induction motor.  
          15 Hp 3-ph induction motor.  
Area B : Lighting load 3-ph, 20Hp.  
          Heating load 70 kW 3-ph.  
Determine transformer capacity.  
(Assuming Demand factor of 0.65, future load of 10% and factor of safety of 1.2).

**OR**

10. a) Write short note on PCC and MCC. 7  
b) Explain various factors deciding selection of transformer. 7
11. a) Discuss the main objectives of system earthing and equipment earthing as per IS 3043. 7  
b) Discuss the following terms as per IE Rules : 6  
i) Linked switch  
ii) Cutout  
iii) Point of supply

**OR**

12. a) Draw and explain pipe type earthing as per IS 3043 and also explain the effect of salt of moisture content on soil Resistivity. 7  
b) Define and discuss the significance of touch and step potential with neat sketch. 6

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