SECTION A **(10 MARKS)**

MULTIPLE CHOICE

Please write down the answer of your choice in the answer booklet by choosing the options A, B, C or D

1. In a three-phase system, the voltage are separated by:

   A. 45 ° B. 90°

   C. 120° D. 180°

2. In a certain three-wire star connected load, the phase voltages are 2kV. The magnitudes of the line voltages are:

   A. 2000V B. 6000V

   C. 666V D. 3464V

3. In a three phase system, when the loads are perfectly balanced, the neutral current is :

   A. 0 B. 120 A

   C. Maximum D. Minimum

4. In a star - connected Circuit, the magnitude of each line current is:

   A. One-third of the phase current B. 0

   C. √3 times the corresponding phase current D. equal to the corresponding phase current.

5. In a balanced three-phase load, each phase has:

   A.an equal amount of power B. one-third of total power

   C. two-third of total power D. a power consumption equal to $\sqrt{3V_L}\ I_L$

6. A constant load power means a uniform conversion of:

   A. electrical to mechanical energy B. mechanical to electrical energy

   C. current to voltage D. voltage to current

7. When a diode is forward biased, the voltage across it:

   A. is directly proportional to the current B. is inversely proportional to the current

   C. is directly proportional to the source voltage D. remains approximately the same

8. One method of increasing power factor of loads is to install:

A. watt meters B. capacitors banks

C. resistors D. Inductors

9. Since diodes are destroyed by excessive current, circuits must have:

A. higher voltage sources B. current limiting resistors

C. more dopants D. higher current sources

10. When checking a diode, low resistance reading both ways indicate the diode is:

A. open B. satisfactory

C. faulty D. perfectly all right

SECTION B (40 MARKS)

3 PHASE SYSTEMS

1. Draw the three phase waveform from 0 – 360 degrees.

   (3 marks)

2. State the effects of broken neutral. **(2 marks)**

3. Compare the two types of three phase connections. Mention at least five (5) points in each case.

   (5 marks)

4. Give two functions of neutral conductor in a three phase four wire system. **(4 marks)**

5. Three identical coils, each with resistance of 12 ohms and inductance of 38mH are connected in star to a 415 volts 50 hertz three phase supply, calculate
   a) Inductive reactance of each coil
   b) Impedance of each phase
   c) Phase current
   d) Line current
   e) Power

   (10 marks)

6. A 415V, three phase-four wire star connected system supplies three resistive loads of 30 kW, 15 kW and 10 kW determine the current in each line.

   (6 marks)

7. Three coils each having resistance 3Ω and inductive reactance 4Ω are connected (i) in star and (ii) in delta to a 415V, 50Hz, 3 phase supply. Calculate for each connection (a) the line and phase voltages and (b) the phase and line currents.

   (10 marks)

SECTION C **(40 MARKS)**

POWER FACTOR IMPROVEMENT

1. A factory installation has the following loads:
   i) Incandescent lamps- 10kW
   ii) Heater - 30kW
   iii) Motor - 40kVA at p.f. of 0.8 lagging

   a) Calculate the total active load in kW.
   b) Calculate the total kVAr
   c) Calculate the total kVA
   d) Calculate the p.f. of the installation **(8marks)**

2. Give four advantages of power factor improvement. **(4 marks)**
3. Give five serious effects of low power factor on A.C supply system. **(5 marks)**

4. The power being supplied to a factory is 900kW and apparent power is 1100kVA, calculate the power factor. **(3 marks)**

5. Power factor of a 115 volts, 60 hertz motor when taking full load current of 80 amps is 0.707, calculate
   a) The supply current when power factor is improved to unity.
   b) Capacitor current to improve power factor to unity.
   c) Reactance of the capacitor
   d) Capacitance of the capacitor **(12 marks)**

6. A welding plant set draws 70A from a 400V AC (single phase) supply at a pf of 0.7 lagging.
   Calculate:
   a) its kVA
   b) its power in kW

   (8 marks)

SECTION D **(10 MARKS)**

RECTIFIERS

1) Draw the circuit diagram of the following rectifier circuits, giving the input and output waveforms.
   a) Single phase half wave
   b) Single phase full wave bridge rectifier
   c) Three phase half wave **(10 marks)**

THE END