

# SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations

February 2022

Course Code: EEE101

Course: BASIC ELECTRICAL ENGINEERING

Question Paper No. : UGF008

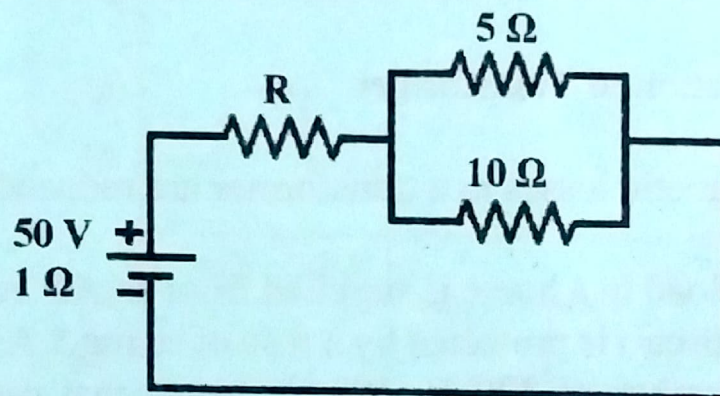
Max. Marks: 100

## PART – A

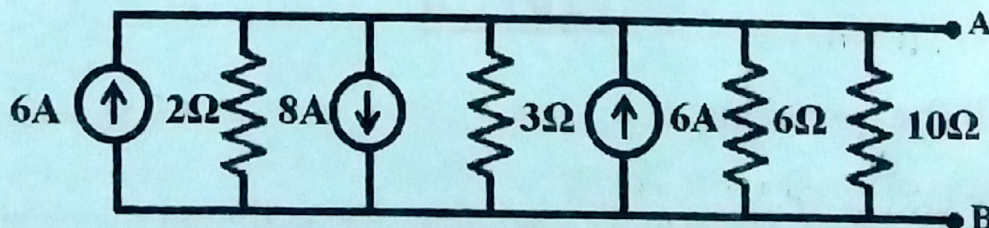
Answer all the questions

10 x 2 = 20 Marks

1. Determine the value of  $R$  such that the power dissipated in the  $5\ \Omega$  resistor is 100 W. Assume the internal resistance of the 50 V battery is  $1\ \Omega$ .



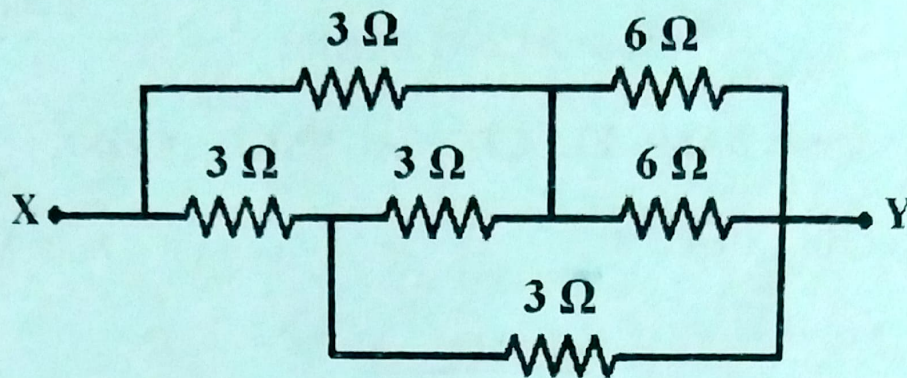
2. Transform the given circuit into a single voltage source equivalent across terminals AB.



3. When a sinusoidal voltage of 120 V is applied across a load, it draws a current of 8 A with phase lead of  $30^\circ$ . Determine the resistance and reactance of the load.



4. Calculate the equivalent resistance of the network across terminals X and Y.



5. An air cored solenoid has a radius of 1cm and length of 20 cm. Determine the number of turns required for a current of 1A to produce a magnetic flux density of  $0.1\ \text{Wb/m}^2$ .
6. Write the differences between electric and magnetic circuits.
7. Define regulation of Transformer.
8. How the magnetic losses in a transformer are reduced?
9. The lighting load in a home is supplied from an AC voltage of 220 V, 50 Hz. This circuit is protected by a fuse of rating 5 A. Determine the maximum number of 220 V, 100 W lamps that can be turned on simultaneously when energized from this supply.
10. Mention any two IE rules related to domestic wiring.

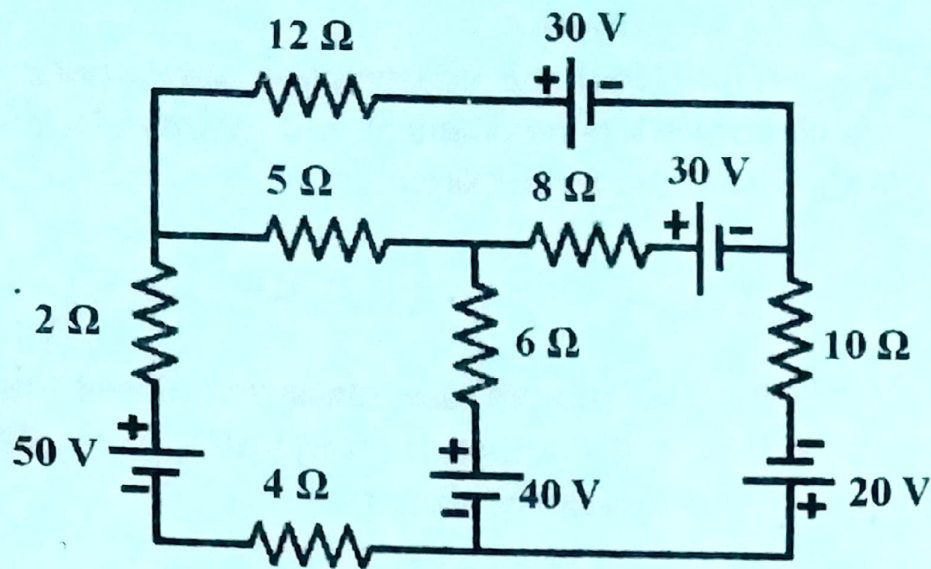
### PART – B

**Answer all the questions**

**4 x 15 = 60 Marks**

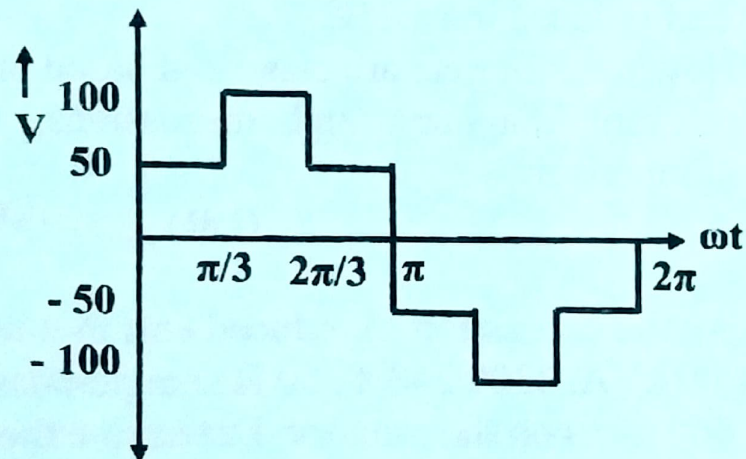
11. In the given circuit, apply suitable method and determine the following (i) current in all the resistors (ii) power dissipation in all the resistors.





(OR)

12. (a) The output voltage obtained from the inverter is as follows. Calculate rms value of output voltage and peak factor of this voltage waveform.



If this rms output voltage of inverter is supplying a load circuit which has three parallel connected resistances of  $50\ \Omega$ ,  $100\ \Omega$  and  $200\ \Omega$  respectively, determine the total current and current through each branch. (8)

- (b) A choke coil of negligible resistance draws a current of 12 A when connected to 220 V, 50 Hz mains. A non-inductive resistor under the same supply voltage condition draws a current of 16.5 A. If the choke coil and non-inductive resistor are connected in series and placed across the same power supply, find the impedance, total current and power factor. (7)



13. Discuss in detail the construction and working of a DC machine which converts mechanical energy into electrical energy. Illustrate your answer with neat sketch.

(OR)

14. How the DC motors are classified based on the field winding connection with armature winding? Exemplify each type with appropriate equivalent circuit.
15. (a) Two identical coils A and B consisting of 1500 turns each lie in parallel planes such that 70% of the flux produced by the current in coil A link the coil B. A current of 4 A flowing in the coil A produces in it a flux of 0.04 mWb. Calculate (i) self-inductance of each coil (ii) mutual inductance between them (iii) If the current in coil A changes from 4 A to - 4 A in 0.02 s, what will be the emf induced in coil B? (7)
- (b) How transformers are classified based on the construction? With relevant diagrams and discussions, carry out the detailed comparison. (8)

(OR)

16. Derive the expression of induced emf in transformer.  
If A 40 kVA, 3300/240 V, 50 Hz single-phase step-down transformer has 660 turns on the primary. Determine the following
- (a) Number of turns on the secondary
  - (b) Maximum value of flux in the core
  - (c) Approximate value of full load primary and secondary currents. Internal drops in the windings are neglected
  - (d) Secondary voltage when primary is connected to 220 V DC supply.
17. (a) Construct a single line diagram of electric power supply scheme and give a brief description about transmission and distribution system with appropriate change in voltage levels starting from generating station to consumer end. (8)



- (b) Explain how plate earthing is implemented in our home. Illustrate your answer with neat sketch. (7)

(OR)

18. (a) Explain about different types of wiring methods used for house wiring. (8)
- (b) A factory has a 240 V supply from which the following loads are taken.
- Lighting : 300 lamps of 150 W each , 400 lamps of 100 W each and 500 lamps of 60 W each.
- Fan : 75 fans of 70 W each
- Heating : A total of 100 kW heating load
- Motors : A total of 60 kW
- Assuming that the lighting load is on for a period of 8 hours /day, fan load for 10 hours/day, the heating load for 8 hours/day and the remainder for 2 hours/day, calculate the weekly consumption of the factory in kWh when working on a 5-day week. (7)

### PART – C

**Answer the following**

**1 x 20 = 20 Marks**

19. (a) (i) A pure inductive coil of 50 turns is wound around an iron core of relative permeability 800. If the length of magnetic path is 25 cm and cross-section sectional area is  $50 \text{ cm}^2$ , determine the self inductance of the coil. If a resistor of  $20 \Omega$  is connected in series with that coil and this series combination is connected across an AC supply voltage of 230 V, 50 Hz, compute the impedance, current, power factor of this RL series circuit.
- (ii) If a load of  $(6-j10) \Omega$  is connected in parallel with the above said series RL combination, calculate the total current, branch currents and combined power factor. With reference to the calculated values, justify the reason for increase in current and leading power factor in the parallel combination for the same supply voltage. (15)



- (b) A balanced star connected load of impedance  $(15+j9.45) \Omega$  per phase is fed from balanced three phase 400 V, 50 Hz supply. Determine the line and phase voltages, line and phase currents, power factor, real power and reactive power consumption in the load circuit. (5)

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