

# CBCS SCHEME



15ELE15/25

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022

## Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. State and explain Kirchoff's laws. (05 Marks)  
b. Two coils having 30 and 600 turns respectively are wound side by side on an iron circuit of section  $100\text{cm}^2$  and mean length 150cm.  
i) Estimate the mutual inductance between two coils. If permeability of iron is 2000  
ii) A current on first coil grows steadily from 0 to 10A in 0.01Sec. Find the EMF induced in other coil. (05 Marks)  
c. Derive an expression for energy stored in magnetic field. (06 Marks)

OR

- 2 a. State and explain :  
i) Fleming's right hand rule  
ii) Faraday's second law of electromagnetic induction. (05 Marks)  
b. Find the current in  $30\Omega$  and  $15\Omega$  resistance, total voltage and total power for the following electric circuit.

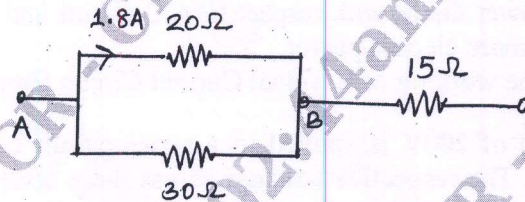


Fig Q2(b)

(05 Marks)

- c. Apply Kirchoff's laws to find the potential difference between X and Y shown in the electric network, when switch 'S' is closed.

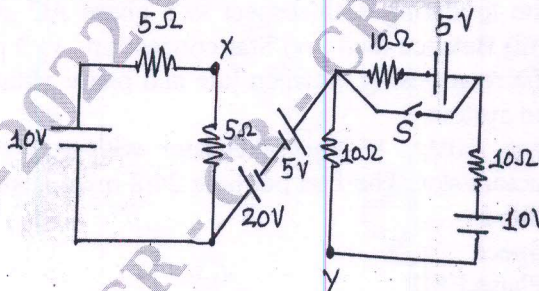


Fig Q2(c)

(06 Marks)

### Module-2

- 3 a. Explain the electrical characteristics and mechanical characteristic of a D.C series motor with neat sketches and mention its applications. (05 Marks)  
b. Explain the working principle of a single phase induction type energy meter with neat diagram, show that deflecting torque is proportional to average power. (05 Marks)  
c. A 4 pole, 100V, D.C shunt generator with lap connected armature having field and armature resistance of  $50\Omega$  and  $0.1\Omega$  respectively supplied sixty 100V, 40W lamps. Calculate the total armature current, current per path and generated EMF. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

OR

- 4 a. Draw the cross-sectional view of 4-pole d.c machine with parts. Explain the functions of following (any three).  
 i) Yoke  
 ii) Field coil  
 iii) Commutator  
 iv) Brush. (05 Marks)
- b. Explain the working of dynamometer type Wattmeter with a neat diagram. (05 Marks)
- c. What do you meant by Back EMF and torque, derive torque equation of d.c motor. (06 Marks)

**Module-3**

- 5 a. Explain the generation of single phase sinusoidal A.C voltage with suitable sketches. (05 Marks)
- b. Explain the concealed conduit wiring with a neat diagram and how it is beneficial to consumers. (05 Marks)
- c. The voltage applied to a series circuit is  $100 \sin(\omega t + 10^\circ)$  and the current is  $10 \sin(\omega t - 30^\circ)$ . Find:  
 i) Impedance  
 ii) Power Factor  
 iii) Power. (06 Marks)

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OR

- 6 a. Define power factor with respect to A.C circuit and how low power factor equipments will consume more electric power. (05 Marks)
- b. Explain the working of Residual Current Circuit Breaker (RCCB) with a neat sketch. (05 Marks)
- c. A voltage of 200V is applied to a series circuit consisting of resistor, an inductor and a capacitor. The respective voltages across these components are 170, 150 and 100V and the current is 4A. Find the power factor of the circuit. (06 Marks)

**Module-4**

- 7 a. Define the following with respect to 3 phase AC system i) Phase sequence ii) Balanced supply iii) Balance load iv) Star connection v) 3 phase 4 wire AC system. (05 Marks)
- b. Obtain the relationship between line and phase values of current in a 3 phase balanced star connected system. (05 Marks)
- c. A 3 phase, 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux per pole 24.8 mwb is sinusoidally distributed. The coils are full pitched. Find:  
 i) Speed  
 ii) Phase EMF  
 iii) Line EMF.  
 Assume winding factor  $K_d = 0.96$ . (06 Marks)

OR

- 8 a. Mention the advantages of rotating field type 3 phase alternator. (05 Marks)
- b. With a neat sketch, explain the construction of non salient pole type rotor. (05 Marks)
- c. Three coils each of impedance of  $20 \angle 60^\circ$  are connected in star to 400V, 3 phase, 50Hz supply. Find the reading on each of the two Wattmeters connected to measure power input. (06 Marks)

**Module-5**

- 9 a. Explain the basic working principle of a transformer. (05 Marks)
- b. The primary winding of a transformer is connected to a 240V, 50Hz AC supply. The secondary winding has 1500 turns. If the maximum value of the core flux is 0.00207wb. Determine :
- The secondary induced emf
  - Number of turns in the primary
  - Core area if  $B_m = 0.465$  Tesla (05 Marks)
- c. A 12 pole, 3 phase alternator is coupled to an engine running at 500rpm. It supplies an induction motor, which has a full load speed of 1440 rpm. Find :
- The frequency of generated emf
  - Number of poles of induction motor
  - % slip. (06 Marks)

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OR

- 10 a. Why the starter is required for 3 phase induction motor? Explain the working principle of star – delta starter with a neat diagram. (05 Marks)
- b. Define the slip of 3 phase induction motor and discuss the performance of motor, when  
i)  $S = 1$  ii)  $S = 0$  iii)  $S < 1$ . (05 Marks)
- c. The maximum efficiency at full load and the unity power factor of a single phase 25KVA, 500/1000V, 50Hz transformer is 98%. Determine its efficiency at
- 75% full load, 0.9 P.F.
  - 50% full load, 0.8P.F. (06 Marks)

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