CBCS SCHEME

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17ELE15/25

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State Ohm's law. Mention what are limitations of Ohm's law. **(06 Marks)**

b. What is the difference of potential between the points X and Y, in the network shown in Fig.Q1(b).

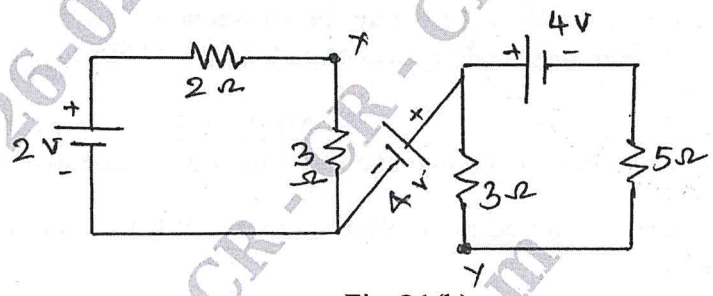

Fig.Q1(b) **(06 Marks)**

c. A coil of 1000 turns is wound on a silicon steel ring of relative permeability 1200. The ring has a mean diameter of 10 cm and cross sectional area of 12 sq.cm. When a current of 4 ampere flows through the coil, determine:

(i) Flux in the core
(ii) Inductance of the coil
(iii) The EMF induced in the coil, if the flux falls to zero in 15 milliseconds
(iv) Now, if another similar coil is placed such that 70% magnetic coupling exists between the coils, find the mutual inductance? **(08 Marks)**

OR

2 a. Mention the three methods used to link conductors with flux to get induced emf. Name the machine/apparatus which each is applicable? **(06 Marks)**

b. State and explain Faraday's laws of electromagnetic induction, Lenz's law and Fleming's right hand rule. **(06 Marks)**

c. Determine the currents in all the branch of the network shown in Fig.Q2(c).

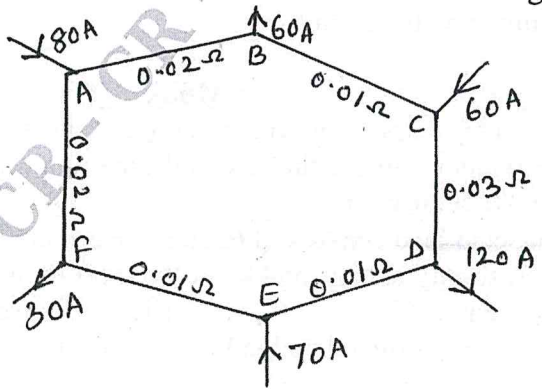

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. With usual notations, derive the EMF equation of a DC generator. **(06 Marks)**

b. With the help of neat diagram, explain the construction and working of Electro-dynamo meter type Wattmeter. **(06 Marks)**

c. A 4 pole, DC shunt motor takes 22 amp from a 250 volts, DC supply. $R_a = 0.5\ \Omega$, and $R_f = 125\ \Omega$. The armature is wave wound with 300 conductors. If the per pole is 0.02 web, determine: (i) Speed (ii) Torque developed (iii) Power developed **(08 Marks)**

OR

4 a. With a neat diagram, explain the construction and working of an Induction type energy meter. **(06 Marks)**

b. Sketch torque versus armature current and speed versus armature current characteristics of a DC shunt and DC series motor. Mention their applications. **(06 Marks)**

c. Draw a neat sketch representing the cut-section view of DC machine. Name the different parts. Explain important features of parts involved there on. **(08 Marks)**

Module-3

5 a. Derive an expression for average value and RMS value of a sinusoidal varying AC voltages. **(06 Marks)**

b. Why Fuse is required in an electric circuit? What are the materials normally used as fuse wires? **(06 Marks)**

c. Two impedances of $Z_1 = 10 + j15\Omega$ and $Z_2 = 6 - j8\Omega$ are connected in parallel. If the total current supplied is 15 Amp, what is the power taken by each branch? **(08 Marks)**

OR

6 a. What is power factor in ac circuits? Which of the following works at: unity pf, lagging pf, leading pf?
(i) Electric iron (ii) Incandescent lamp (iii) Condenser bank
(iv) Induction motor (v) Choke **(06 Marks)**

b. Define domestic wiring. What important factors are to be considered in domestic wiring? **(06 Marks)**

c. A current of average value 14.14 Amp is flowing in a circuit to which a voltage of peak value of 282.8 volts is applied. Determine:

(i) $Z_1 = R \pm j \times \Omega$ (ii) Power if V lags I by $\frac{\pi}{6}$ radians. **(04 Marks)**

d. A circuit consists of resistance of 10 Ω, an inductance of 16 mH and a capacitance of 150 μf series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. **(04 Marks)**

Module-4

7 a. With a neat sketch, explain the constructional features of salient pole alternator. **(06 Marks)**

b. Deduce the relationship for the line and phase values of voltage and current in a 3 phase balanced STAR connections. **(06 Marks)**

c. A delta connected load consists of 6Ω resistances in series with an 8Ω inductive reactance in each phase. A supply voltage of 440 Volts, at 50 Hz is applied to the load. Find:
(i) Phase current (ii) Line current (iii) Power factor
(iv) TRUE power consumed by load (v) Reactive power (vi) Apparent power **(08 Marks)**

OR

8 a. With usual notations, derive an expression for EMF equation of an alternator. **(06 Marks)**

b. A 3 phase, 50 Hz, 16 pole generator with star connected winding has 144 slots with conductor/slot is 10. The flux/pole is 24.8 mweb is sinusoidally distributed. The coil is full pitched. Determine: (i) Speed (ii) EMF/Phase (iii) Line voltage **(06 Marks)**

c. Show that in a three phase, balanced circuit, two wattmeters are sufficient to measure the total three phase power. **(08 Marks)**

Module-5

9 a. Explain the principle of operation of a single phase transformer and derive its EMF equation. **(06 Marks)**

b. A 4 pole, 50 Hz, 3 phase induction motor runs at a speed of 1460 rpm. Find:
(i) Synchronous speed
(ii) The slip
(iii) The frequency of the induced emf in the rotor. **(06 Marks)**

c. In a 25 KVA, 2000/200 volts transformer has iron loss of 350 Watts and full load copper loss of 500 Watts respectively. Calculate the efficiency at
(i) upf, full load
(ii) 0.8 pf, 3/4th full load
(iii) 0.75 pf, ½ full load
(iv) Also determine maximum efficiency of a transformer for full load, at 0.9 pf. **(08 Marks)**

OR

10 a. Explain working of a 3 phase induction in detail with the help of diagram. **(06 Marks)**

b. What are the transformer losses? On what factors do they depend? And how they are minimized? **(06 Marks)**

c. A 250 KVA, 11000/415 Volts, 50 Hz, single phase transformer has 800 turns secondary. Determine:
(i) Number of primary turns
(ii) Maximum value of flux
(iii) Voltage induced per turn
(iv) The rated primary and secondary currents **(08 Marks)**

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