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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 $100cm^2$ 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) Flemings right hand rule
- ii) Faraday's second law of electromagnetic induction. **(05 Marks)**

    b.   Find the current in 30Ω and 15Ω resistance, total voltage and total power for the following electric circuit.
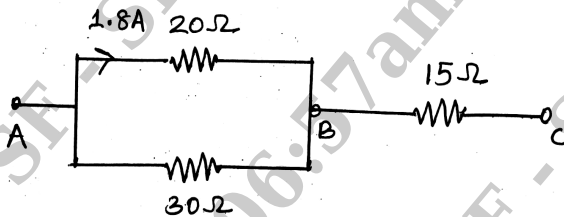

Fig Q2(b)   **(05 Marks)**

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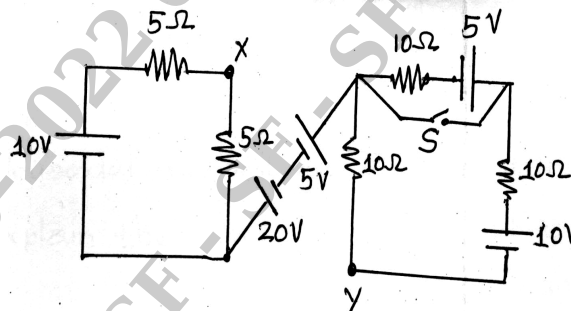

Fig Q2(c)   **(06 Marks)**

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 50Ω and 0.1Ω respectively supplied sixty 100V, 40W lamps. Calculate the total armature current, current per path and generated EMF. **(06 Marks)**

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 $100 \sin(wt + 10°)$ and the current is $10 \sin(wt - 30°)$. Find :
   i)   Impedance
   ii) Power Factor
   iii) Power. **(06 Marks)**

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 $20\underline{|60°}$ 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)**

15ELE15/25

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 1500turns. If the maximum value of the core flux is 0.00207wb. Determine :
  - i) The secondary induced emf
  - ii) Number of turns in the primary
  - iii) 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 :
  - i) The frequency of generated emf
  - ii) Number of poles of induction motor
  - iii) % slip. **(06 Marks)**

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
  - i) 75% full load, 0.9 P.F
  - ii) 50% full load, 0.8P.F. **(06 Marks)**

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