CBCS Scheme

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2017
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 Ohm's Law with an illustration. Also list it's limitations. **(05 Marks)**

b. For the circuit shown in Fig. Q1(b), Obtain voltage between points X and Y. **(06 Marks)**

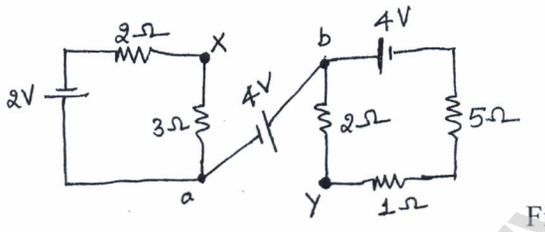

Fig. Q1(b)

c. Obtain relationship between self inductance of two coils, mutual inductance between the coils and co-efficient of coupling. **(05 Marks)**

OR

2 a. State and explain KCL and KVL with illustration for each. **(05 Marks)**

b. Coil A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04Wb in it. If co-efficient of coupling is 0.2, calculate :
   i) Self inductance of coil A when coil B is open circuited
   ii) emf induced in coil B when flux changes from full value to zero in 0.02s
   iii) Mutual inductance. **(06 Marks)**

c. With illustrations, explain statically and dynamically induced emfs. **(05 Marks)**

Module-2

3 a. Explain the construction and principle of operation of dynamometer type wattmeter. **(05 Marks)**

b. Discuss about various characteristics of a DC series motor with neat diagrams. **(06 Marks)**

c. A 30kW, 300V, DC shunt Generator has armature resistance of 0.05Ω and field resistance of 100Ω. Calculate power developed by the armature when it delivers full output power. **(05 Marks)**

OR

4 a. Derive emf equation for a DC Generator. **(05 Marks)**

b. Explain the construction and principle of operation of a single phase induction type energy meter. **(06 Marks)**

c. A 4 pole, DC shunt motor takes 22.5A from 250V supply. The armature is wave wound with 300 conductors. The armature resistance is 0.5Ω and field resistance is 125Ω. If useful flux per pole is 0.02Wb ; calculate :
   i) Speed ii) Torque developed iii) Electrical power developed. **(05 Marks)**

Module-3

5 a. With a neat connection diagram and functional table, explain three way control of a lamp. **(05 Marks)**

b. An alternating voltage (80 + j60)V is applied to a circuit and the current flowing through it is (–4 + j10) A. Find the i) impedance of the circuit ii) phase angle iii) pf of the circuit iv) power consumed by the circuit. **(06 Marks)**

c. For the circuit shown Fig. Q5(c), Find ;
i) Current in each branch ii) Power factor of the circuit. **(05 Marks)**

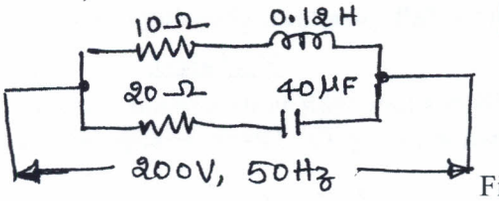

Fig. Q5(c)

OR

6 a. Show that the power consumed by a pure capacitor is zero. Draw the voltage, current and power waveforms. **(05 Marks)**
b. What is earthing? Explain any one type with neat diagram. **(06 Marks)**
c. A series RLC circuit with 100Ω, 25μF and 0.15H is connected across 220V, 50Hz supply calculate : i) impedance ii) current iii) p.f iv) voltage drops across inductor and capacitor. **(05 Marks)**

Module-4

7 a. Mention advantages of 3 phase system over 1 phase system. **(05 Marks)**
b. Three arms of a 3ϕ, delta connected load, each comprise of a coil having 25Ω resistance and 0.15H inductance in series with a capacitor of 120μF across 415V, 50Hz supply. Calculate line current, power factor and power consumed. **(06 Marks)**
c. A 3ϕ, 4 pole, 50Hz star connected alternator has 36 slots with 30 conductors per slot. The useful flux per pole is 0.05Wb. Find synchronous speed and line voltage on no-load. Assume winding factor of 0.96. **(05 Marks)**

OR

8 a. Mention the advantages of stationary armature of an alternator. **(05 Marks)**
b. Establish the relationship between line and phase voltages and currents in a 3ϕ star connected balanced circuit. Shown the vector diagram neatly. **(06 Marks)**
c. Calculate power, power factor and line current in a balanced 3ϕ star connected system drawing power from 440V supply in which two wattmeters connected indicate W_1 = 5kW and W_2 = 1.2kW. **(05 Marks)**

Module-5

9 a. Derive the condition for maximum efficiency of a transformer, **(05 Marks)**
b. Explain with neat vector diagrams, the concept of rotating magnetic field theory. **(06 Marks)**
c. Define slip speed and slip. What is the slip speed, slip and at what speed rotor runs if the frequency of the emf in the stator of a 4 pole, 3ϕ IM is 50Hz and in the rotor is 1.5Hz? **(05 Marks)**

OR

10 a. Derive emf equation of a transformer. **(05 Marks)**
b. With neat diagrams, explain construction of types of rotors of 3ϕ induction motor. **(06 Marks)**
c. A 10KVA, 1ϕ transformer has a primary winding of 300 turns and secondary winding of 750 turns, cross sectional area of core is 64cm^2. If primary voltage is 440V at 50Hz, find maximum flux density in the core, emf induced in secondary of transformer. At 0.8 lag p.f, calculate the efficiency of transformer if full load copper loss is 400W and iron-loss is 200W. **(05 Marks)**

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