17ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2019
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-I

1 a. State and explain Kirchhoff's laws with an example. **(06 Marks)**

b. A resistance R is connected in series with a parallel circuit comprising of 200 and 480. The total power dissipated in the circuit is 1000w and the applied voltage is 250V. Calculate R and the current through R. **(06 Marks)**

c. State and explain Faraday's laws of electromagnetic induction. **(08 Marks)**

OR

2 a. Obtain an expression for energy stored in an inductor. **(06 Marks)**

b. A coil consists of 1000 turns and a current of 10A in the coil gives rise to a magnetic flux of 2mwb. Calculate i) self inductance of the coil ii) the energy stored iii) the emf induced when the current is reversed in 0.01sec. **(07 Marks)**

c. Define coefficient of coupling and derive its relationship with self inductances and the mutual inductance. **(07 Marks)**

Module-2

3 a. Derive the EMF equation of a DC generator. **(06 Marks)**

b. An 8 pole DC generator has 500 armature conductors and useful flux/pole of 0.065wb. What will be the emf generated if it is lap connected and runs at 1000rpm? At what speed if must be driven to produce the same emf if at is wave connected? **(06 Marks)**

c. With a neat diagram, explain the construction and working of an induction types energy meter. **(08 Marks)**

OR

4 a. Derive the expression for armature torque developed in a DC motor. **(06 Marks)**

b. A 4pole, 220V lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of 40A from the supply. The field resistance and armature resistances are 1100 and 0.10 respectively. The flux/pole is 40 mwb. Calculate i) the speed ii) the torque developed by the armature iii) shaft torque if the output power is 6 KW. **(08 Marks)**

c. With the help of a neat diagram, explain the construction and working principle of electrodynamometer type wattmeter. **(06 Marks)**

Module-3

5 a. Derive an expression for the power consumed in a series R—L— ac circuit and draw voltage, current and power waveform. **(06 Marks)**

b. With a neat sketch, explain 2-way control of lamps. **(06 Marks)**

c. A series circuits of a resistance of 100, an inductance of 16mH and a capacitance of 1501AF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the impedance, current p.f and power consumed in the circuit. **(08 Marks)**

OR

6 a. Prove that the power consumed in a pure capacitor is zero, when connected to an alternating voltage source. Draw the waveforms for voltage, current and power **(06 Marks)**

b. What is earthing? Explain any one type of earthing with a neat diagram. m **(06 Marks)**

c. A parallel circuit has a resistor of 200 in series with an inductive reactance of 1552 in one branch and a resistor of 30Q in series with a capacitive reactance of 2052 in the other branch.

If the total current drawn by the parallel circuit is 101-30 Amps, determine the current and power dissipated in each branch. **(08 Marks)**

Module-4

7 a. Obtain the relationship between phase and line values of voltages and currents in a balanced star connected system. **(06 Marks)**

b. With neat sketches, explain the construction of two types of alternators. **(08 Marks)**

c. A 3-phase 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux/pole is 24.8 mwb and the coils are full pitched. Find: i) the speed ii) the line emf. Assume the distribution factor kd = 0.96. **(06 Marks)**

OR

8 a. Show that two wattmeters are sufficient to measure 3 phase power and power factor of the circuit in a 3 phase balanced circuit. **(08 Marks)**

b. A balanced 3 phase star connected system draws power from 440V supply. The 2 wattmeters connected indicate W1 = 5Kw and W2 = 1.2 KW. Calculate power, power factor and current in the circuit. **(06 Marks)**

c. Derive the emf equation of an alternator with usual notations. **(06 Marks)**

Module-5

9 a. Explain the principle of working of a single phase transformer and derive the expression for K. **(06 Marks)**

b. The primary winding of a 25KVA transformer has 200 turns and is connected to 230, 50Hz supply. The secondary turns are 50. Calculate : i) no load secondary emf ii) full load primary and secondary currents iii) the flux density in the core, if the cross section of the core 60cm ^{2}. **(06 Marks)**

c. Explain the concept of rotating magnetic field in case of a 3phase induction motor. **(08 Marks'**

OR

10 a. Explain the losses occurring in a single phase transformer. **(06 Marks)**

b. A transformer is rated at 100KVA. At full load its copper loss is 1200W and the iron loss is 960W. Calculate :

i) The efficiency of full load, u.p.f

ii) The efficiency of at half load, 0.8p.f

iii) The load KVA at which maximum efficiency occurs

iv) Maximum efficiency at 0.85 p.f **(08 Marks)**

c. A 4 pole, 3-0, 50Hz induction motor runs at a speed of 1470rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this conditio n. **(06 Marks)**