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14ELE15/25

First/second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least ONE question from each part.

Module-1

1.
 - a. State and explain Kirchoff's laws. (06 Marks)
 - b. Derive an expression for the energy stored in a magnetic field. (06 Marks)
 - c. Two coupled coils of self inductances 0.8H and 0.2H, have a co-efficient of coupling 0.9. Find the mutual inductance and turns ratio. (08 Marks)
2.
 - a. State and explain :
 - i) Fleming's left hand rule ii) Faraday's second law of electro-magnetic induction. (06 Marks)
 - b. The total power consumed by the network shown in Fig.2(b) is 16W. Find the value of 'R' and total current. (06 Marks)

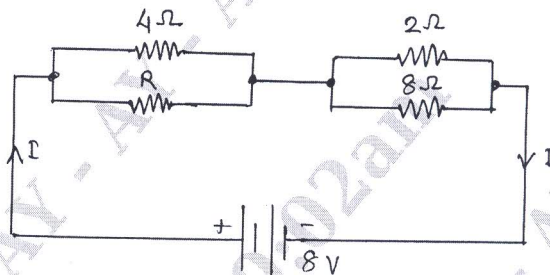


Fig.2(b)

- c. In the circuit shown in Fig.2(c), find the voltage across A and B if i) switch 'S' is opened ii) Switch 'S' is closed.

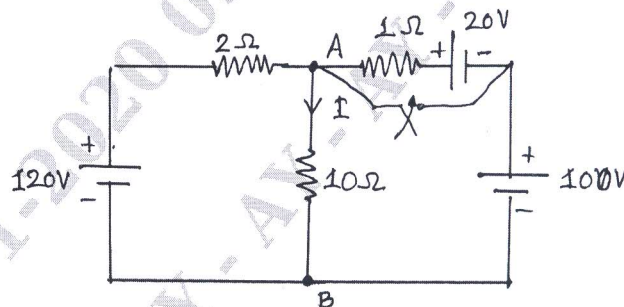


Fig.Q2(c)

(08 Marks)

Module-2

3.
 - a. Draw the cross sectional view of a DC machine with parts, mention the functions of following : i) Yoke ii) Field winding iii) Pole shoe iv) Commutator. (06 Marks)
 - b. Explain with a neat diagram, the constructional features and operation of an induction type single phase energy meter. (08 Marks)
 - c. A 4 pole, 100V DC shunt generator with lap connected armature, having field and armature resistance of 50Ω and 0.1Ω respectively, supplies sixty, 100V, 40W lamps. Calculate the total armature current, current per path and generated emf. Allow a contact drop of 1 volt per brush. (06 Marks)

- 4 a. Derive an EMF equation of DC generator. (06 Marks)
 b. Explain with a neat diagram working principle of dynamometer type wattmeter. (06 Marks)
 c. A 200V, lap wound, DC shunt motor has 800 conductors on its armature. The resistance of the armature winding is 0.5Ω and that of shunt field winding is 200Ω . The motor takes a current of 21A, the flux per pole is 30mwb. Find the speed and gross torque developed in the motor. (08 Marks)

Module-3

- 5 a. What is meant by power factor in an AC circuits? What is its significance in AC circuits? (04 Marks)
 b. Show that current 'i' lags 90° to the applied voltage 'v' for pure inductance AC circuit. (04 Marks)
 c. Explain 2-way control and 3-way control of lamp with suitable circuit diagram. (06 Marks)
 d. A current $i = \sin(31t + 10^\circ)$ produces a potential drop $v = 220\sin(31t + 20^\circ)$ in a circuit. Find the values of circuit parameters, assuming a series combination. Assume $\omega = 31\text{rad/sec}$. (06 Marks)
- 6 a. Deduce a condition at which an RLC circuit behaves like a resistive circuit. (06 Marks)
 b. Write a short note on :
 i) Need of earthing ii) Earth leakage circuit breaker. (08 Marks)
 c. Two impedances $Z_1 = 8 + j6\Omega$ and $Z_2 = 3 - j4\Omega$ are connected in parallel across 230V, 50Hz, AC supply. Calculate : i) line current ii) branch currents. (06 Marks)

Module-4

- 7 a. Explain the advantages of rotating field type 3 phase alternator. (06 Marks)
 b. Two wattmeters are connected to measure power input to a 3 phase balanced circuit indicates 8 KW and 0.8KW, the later reading being obtained after reversing the current coil connection. Find : i) P.F of load ii) Active power. (06 Marks)
 c. A 6 pole, 3 phase, 50Hz alternator has 12 slots per pole and 4 conductors per slot A flux of 25 mWb is sinusoidally distributed along the air-gap. Determine the line emf. If the alternator is star connected. Assume winding factor $k_d = 0.96$, pitch factor, $k_p = 1$. (08 Marks)
- 8 a. Explain the terms with reference to 3 phase AC system :
 i) Balanced supply ii) Balanced load iii) Phase sequence
 iv) Star connection v) delta connection vi) 3 phase, 4 wire system. (06 Marks)
 b. Explain the construction of salient pole type rotor with neat diagram. (06 Marks)
 c. Show that in a 3 phase star connected system the line voltage is $\sqrt{3}$ times the phase voltage with suitable circuit diagram and vector diagrams. (08 Marks)

Module-5

- 9 a. Explain the working principle of a transformer. (06 Marks)
 b. If a 6 pole induction motor supplied from a 3 phase, 50Hz, AC supply has a rotor frequency of 2.3Hz. Calculate : i) percentage slip ii) speed of motor. (06 Marks)
 c. Define the voltage regulation, efficiency of transformer and obtain the condition for maximum efficiency. (08 Marks)
- 10 a. Explain the working principle of 3 phase induction motor. (06 Marks)
 b. In a 25 KVA, 2000/200V, single phase transformer, the iron and full load copper losses are 350W and 400W respectively. Calculate the efficiency at unity power factor on :
 i) full load ii) half full load. (06 Marks)
 c. Explain the working of Y- Δ starter with neat diagram. (08 Marks)