

GBCS SCHEME



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18ELE13/23

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 and explain Kirchhoff's laws. (06 Marks)
b. Define RMS value of an alternating quantity. Obtain an expression for it in terms of maximum value. (06 Marks)
c. Find : i) Current in 15Ω resistor ii) Voltage across 18Ω resistor iii) Power dissipated in 7Ω resistor as shown in circuit diagram. Fig.Q1(c).

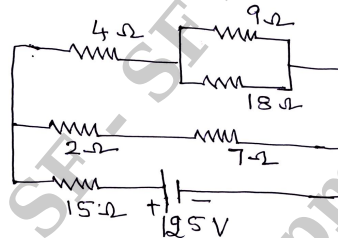


Fig.Q1(c)

(08 Marks)

OR

- 2 a. Define average value of a sinusoidally varying current and find its relation with its maximum value. (06 Marks)
b. State ohm's law and mention its limitations. (06 Marks)
c. For the current waveform shown in Fig.Q2(c).
Find : i) Peak current ii) Average value iii) Periodic time iv) Frequency v) Instantaneous Value at $t = 3\text{ms}$.

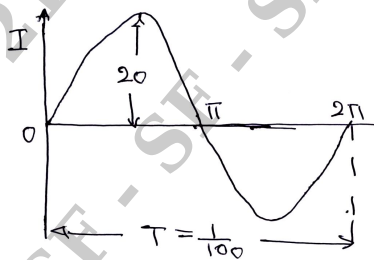


Fig.Q2(c)

(08 Marks)

Module-2

- 3 a. Show that pure inductance does not consume any power. Draw the wave forms of voltage, current and power. When an alternating voltage is applied to a pure inductance. (06 Marks)
b. In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. (06 Marks)
c. A series R-L-C circuit is composed of a $100\ \Omega$ resistance, 1H inductance and $5\ \mu\text{F}$ capacitance. A voltage of $V(t) = 141.4 \cos 377t$ volts is applied to the circuit. Determine the current and voltages V_R , V_L and V_C . (08 Marks)



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OR

- 4 a. Derive an equation for the power consumed by an R – L series circuit. Draw the wave form of voltage, current and power. (06 Marks)
- b. When a three phase balanced impedances are connected in star, across a 3 phase 415V, 50Hz supply, the line current drawn is 20A, at a lagging p.f of 0.4. Determine the parameters of the impedance in each phase. (06 Marks)
- c. Show that two wattmetres are sufficient to measure power in a 3-phase balanced star connected circuit with the aid of neat circuit diagram and phasor diagrams. (08 Marks)

Module-3

- 5 a. Give the constructional details of core type and shell type of transformer. (06 Marks)
- b. Derive the condition for which the efficiency of a transformer is maximum. (06 Marks)
- c. With a circuit diagram, explain the working of a two-way and three way control of lamp. (08 Marks)

OR

- 6 a. With a neat figure, explain pipe earthing. (06 Marks)
- b. What are the various losses that occur in a transformer? Give the equations for these losses. (06 Marks)
- c. A single phase transformer working at 0.8p.f has an efficiency of 94% at both three-fourth full load and full load of 600Kw. Determine the efficiency at half full load, unity power factor. (08 Marks)

Module-4

- 7 a. Derive the EMF equation of a DC generator. (06 Marks)
- b. What is back emf in a DC motor? What is its significance? (06 Marks)
- c. A 4 pole, DC shunt generator with lap connected armature has field and armature resistance of 50Ω and 0.1Ω respectively, if the generator supplies sixty 100V, 40W lamps, calculate the total armature current, the current in each armature conductor and the generated EMF. Take 1V per brush as contact drop. (08 Marks)

OR

- 8 a. Derive an equation for the torque developed in the armature of a DC motor. (06 Marks)
- b. Sketch T_a V/S I_a and N V/S I_a characteristics of : i) Shunt motor ii) Series motor
Mention two applications of each motor. (06 Marks)
- c. 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 110Ω and 0.1Ω respectively. The motor develops an output power of 6KW. The flux per pole is 40m Wb. Calculate :
i) The speed ii) The torque developed by the armature iii) The shaft torque. (08 Marks)

Module-5

- 9 a. Derive the emf equation of an synchronous generator. (06 Marks)
- b. Define slip of an induction motor and derive expression for frequency of rotor current. (06 Marks)
- c. With neat sketches explain the construction of two types of synchronous generator. (08 Marks)

OR

- 10 a. Explain clearly the working principle of a three phase induction motor. (06 Marks)
- b. A 6pole, 3 phase star connected alternator has an armature with 90 slots and 12 conductor per slot. It revolves at 1000 rpm, the flux per pole being 0.5 Wb. Calculate the emf generated if the winding factor is 0.97 and all the conductors in each phase are in series the coil is full pitched. (06 Marks)
- c. Explain the concept of rotating magnetic field in case of a 3 phase induction motor. (08 Marks)