

CBCS SCHEME

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17ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2021 Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. State and explain Kirchoff's laws with one illustration each. (06 Marks)
b. For the network shown below in Fig.Q1(b), determine all the branch currents.

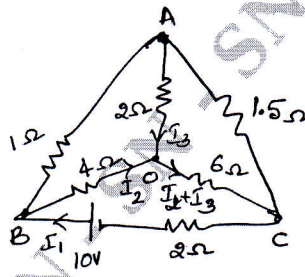


Fig.Q1(b)

- c. State the following : (08 Marks)
i) Fleming's right hand rule
ii) Fleming's left hand rule. (06 Marks)
- 2 a. State explain Faraday's Laws of electromagnetic induction. (06 Marks)
b. Find the inductance of a coil of 200 turns wound on a paper core tube of 25cm length and 5cm radius. Also calculate energy stored in it if current rises from zero to 5A ($\mu_r = 1$). (08 Marks)
c. Obtain the relation between self inductance, mutual inductance and co-efficient of coupling. (06 Marks)
- 3 a. With a neat diagram, explain the construction of a DC generator. (08 Marks)
b. With neat sketches explain the characteristics of a DC shunt motor. (06 Marks)
c. A 4pole, 100V 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, the current per path and the generated emf. Allow a contact drop of 1 volt per brush. (06 Marks)
- 4 a. With a neat diagram explain the construction and working of an induction type energymeter. (06 Marks)
b. A four-pole DC shunt motor takes 22.5A from a 250V supply. $R_a = 0.5\Omega$ and $R_f = 125\Omega$. The armature is wave-wound with 300 conductors. If the flux per pole is 0.02wb, calculate :
i) The speed
ii) Torque developed
iii) Power developed. (08 Marks)
c. Derive the expression for armature torque developed in a DC motor. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 5 a. With a neat connection diagram and switching table, explain 3 way control of lamp. (06 Marks)
- b. Obtain the expression for the current through the pure inductor, if the voltage across it is $v = V_m \sin \omega t$. (06 Marks)
- c. Two impedances $20 \angle -45^\circ \Omega$ and $30 \angle 30^\circ \Omega$ are connected in series across a certain AC supply and the resulting current is found to be 10Amps. If the supply voltage remains unchanged calculate the supply current when the two impedances are connected in parallel. (08 Marks)
- 6 a. Write a short note on :
 i) Necessity of earthing (08 Marks)
 ii) Precautions to be taken to prevent electric shock. (06 Marks)
- b. A series circuit with $R = 10\Omega$, $L = 50\text{mH}$ and $C = 100\mu\text{F}$ is supplied with 200V, 50Hz. Find:
 i) The impedance ii) Current iii) Power iv) Power factor. (06 Marks)
- c. Define real power, reactive power, apparent power and power factor. (06 Marks)
- 7 a. Obtain the relationship between line and phase voltage and current in a 3ϕ balanced star connected system. (08 Marks)
- b. A 440V, 3 phase AC motor has an output of 80Hp and operates at a power factor of 0.866 with an efficiency of 90% calculate :
 i) The current in each phase of the motor if the motor is delta connected.
 ii) The readings of the two wattmeters connected in the lines to measure the input power. (06 Marks)
- c. With usual notation derive the expression for EMF equation of an alternator. (06 Marks)
- 8 a. Show that the power in a balanced 3-phase circuit can be measured by 2 wattmeter. Draw the circuit and vector diagram. (08 Marks)
- b. Mention different types of synchronous generator and explain the construction of each type. (06 Marks)
- c. A 3-phase, 50Hz 16-pole generator with star connected winding has 144 slots with 10 conductor/slot. The flux / pole 24.8mwb is sinusoidally distributed. The coils are full pitched. Find : i) speed ii) the line emf. Given $k_d = 0.96$. (06 Marks)
- 9 a. Derive the condition for which the efficiency of a transformer is maximum. Also derive the emf equation of a transformer. (08 Marks)
- b. If the electromotive force in the stator of an 8 pole induction motor has a frequency of 50Hz and that in the rotor 1.5Hz, at what speed is the motor running and what is the slip? (06 Marks)
- c. Define slip. Derive an expression for frequency of rotor current. (06 Marks)
- 10 a. With neat diagram, explain the construction of types of rotor of 3ϕ induction motor. (06 Marks)
- b. A 600KVA single phase transformer has an efficiency of 92% both at full-load and half load at unity power factor. Determine its efficiency at 75% of full load at 0.9 power factor lag. (08 Marks)
- c. Explain why induction motor never runs at synchronous speed. (06 Marks)
