

B. CSE 2ND YEAR 1ST SEM. SUPPLEMENTARY EXAM.-2017

ELECTRICAL TECHNOLOGY

Time : Three hours

Full Marks 100

No. of questions	Answer any <i>five</i> (5×20) questions	Marks
1. a)	When an emf $v(t) = 110\sqrt{2} \sin(314t - 30^\circ)V$ is applied across a circuit, the current through the circuit is $i(t) = 10\sqrt{2} \sin(314t + 30^\circ)A$. Find the (i) the circuit elements connected (ii) Power supplied by the source (iii) power factor of the circuit. (iv) Show representative phasor diagram.	10
b)	A series RLC circuit, with $R = 5\Omega$, $L = 4mH$, $C = 5\mu F$ is connected across a 110V, variable frequency AC source. Discuss the effects of varying the frequency of the voltage supply upon the current drawn and power factor in this circuit. Deduce and calculate the bandwidth of the circuit.	10
2. a)	What is reluctance of a magnetic circuit? Derive the equation of reluctance in terms of physical dimensions of the magnetic structure.	6
b)	How will the core loss in ferromagnetic material change with change in frequency of excitation?	6
c)	Explain hysteresis loss in ferromagnetic materials. How can this be reduced?	8
3. (a)	How can you change the phase sequence in a polyphase network? Explain with a schematic.	4
(b)	With proper circuit diagram and derivation, show that wattmeters in two wattmeter method of power measurements may show negative reading for normal operation.	8
(c)	Three impedances each of $(30+j40)\Omega$ are connected in delta and this combination is connected to balanced 3-phase 400V, 50Hz supply. Find (i) line current to the load (ii) phase current of the load. If two wattmeters are connected to measure the power consumed by the load, find (iii) the power measured by each wattmeters, (iv) total power consumed by the load. Draw the circuit diagram.	8
4. (a)	A 220V, DC shunt generator has armature and field resistance of 0.1Ω and 220Ω respectively. When run as a generator at 1000rpm it delivers 10kW. Calculate the speed of the same machine when run as a shunt motor drawing 10kW from a 220V DC bus.	6
(b)	Draw and explain external characteristics of a series generator with proper derivation.	7
(c)	How can you control the speed of a shunt motor? Explain with proper circuit diagrams.	7
5. (a)	Draw and explain no-load phasor diagram of an ideal transformer.	6
(b)	Show that kVA rating of both primary and secondary of an ideal single phase two winding transformer are same.	6
(c)	The no-load current of a single phase transformer is 8A at a power factor of 0.25. If the transformer is connected to a 400V, 50Hz supply. Find (i) iron loss (ii) magnetizing component of current (iii) flux peak in the core. Consider number turns of primary to be 800.	8
6. (a)	Derive the torque-slip characteristics of an induction motor. Mark regions of operation on the curve.	10
(b)	In a 3-ph, 4-pole slip ring induction motor the rotor frequency is 5Hz, when the stator is connected to 400V, 50Hz 3-ph supply. Find per phase induced emf in rotor if number turns per phase are same for stator and rotor.	10
(c)		
7. (a)	Explain different starting methods used for a synchronous motor.	6
(b)	Derive and draw power (torque)-angle characteristics of a synchronous machine. Mention various ranges of operation and pull-out torque.	8
(c)	Explain in brief the method of synchronizing an alternator to an existing network. What are the preconditions?	6