Code No. : 3257

FACULTY OF ENGINEERING
B.E. 2/4 (E & EE) I Semester (Main) Examination, December 2010
ELECTRICAL CIRCUITS – I

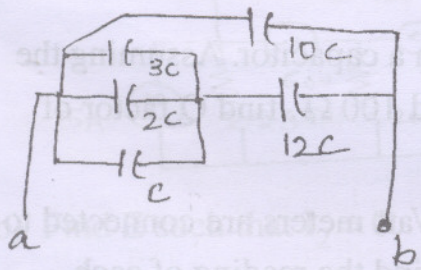
Time : 3 Hours] [Max. Marks : 75

Note : *Answer* ***all*** *questions from Part – A. Answer* ***five*** *questions from Part – B.*

PART – A **(2.5×10 = 25 Marks)**

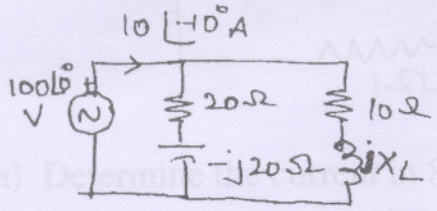
1. Find the power absorbed by an element for t = 10 sec if the current is $2e^{-0.1t}$ and voltage across the element is $V = \frac{6\,di}{dt}$. 2

2. Find the equivalent capacitance for the given combination. 3



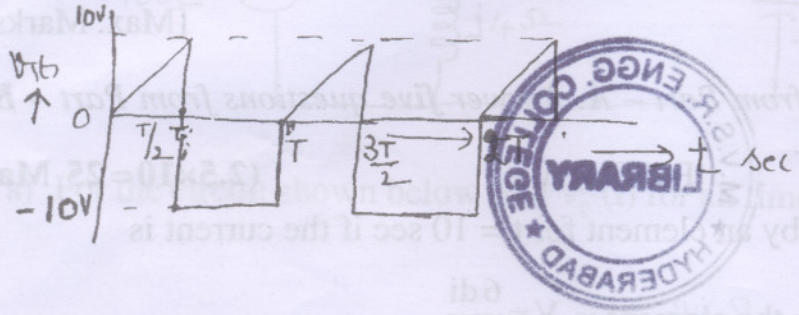
3. State and explain Reciprocity theorem and give its application. 3

4. In the network shown find X_L. 2



5. The current in a circuit lags the voltage by 30°. If the input power be 480 W and supply voltage be V = 100 sin $(377t + 20^\circ)$. Find the complex power. 2

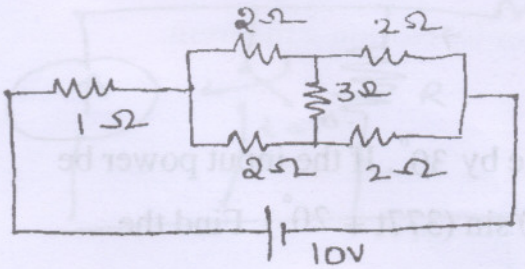
6. What is the rms value of the periodic waveform shown , where Time period T = 4 sec ? 3



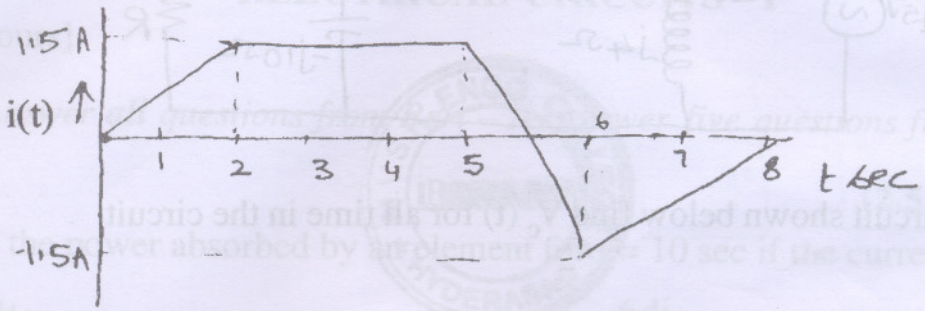
7. A dc voltage of 20V is applied to an RL circuit where R = 5 Ω and L=10H. Find
   a) The time constant and
   b) Maximum value of energy stored. 2
8. A coil produces resonance at 20 KHz in series with a capacitor. Assuming the inductance and resistance of the coil to be 10H and 100 Ω, find Q factor of the coil. 2
9. A 3ϕ 400V load has a power factor of 0.4. Two Watt meters are connected to measure the power. If the input power be 10KW. Find the reading of each instrument. 3
10. How filters are classified ? mention the different types of filters. 3

PART – B **(5×10=50 Marks)**

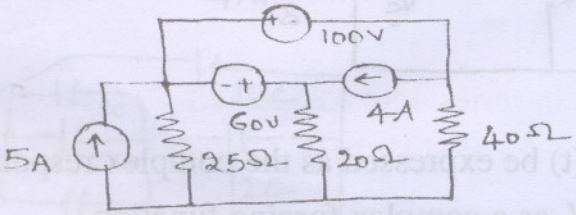
11. a) Find the power loss in 1 Ω resistor. 4



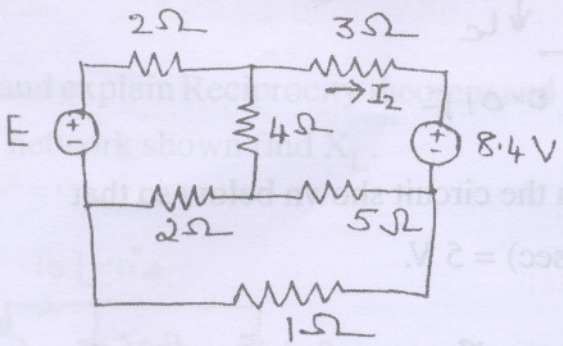
b) A current wave i (t) is applied to an inductance of 10H. Find V(t) and sketch it. 6



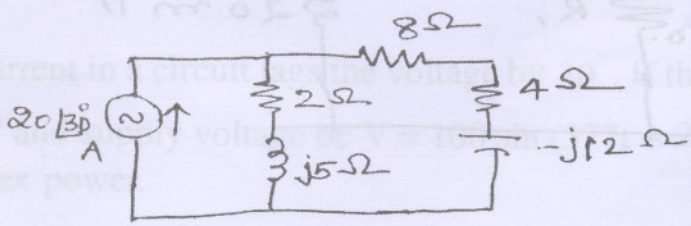
12. a) Find the voltage across 40 Ω resistor and the power supplied by 5A source using Nodal analysis method. 6



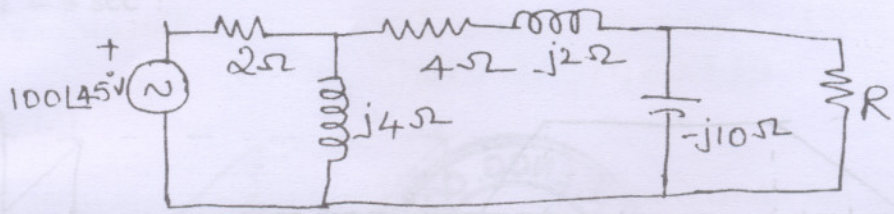
b) Find E such that $I_2 = 0$. 4



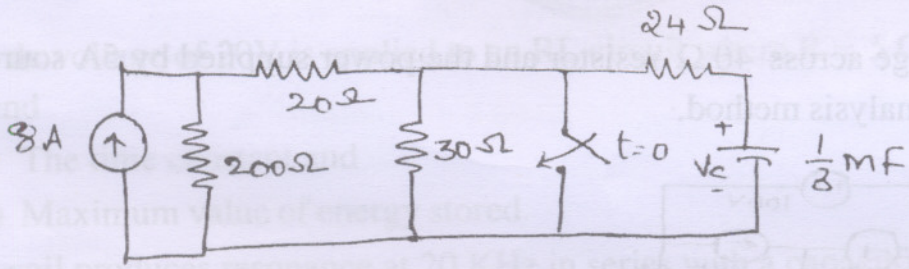
13. a) Determine the current in 8Ω resistor by Norton's theorem. 5



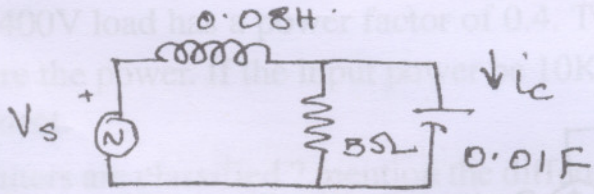
b) Determine the value of R so that maximum power is transferred to it. 5



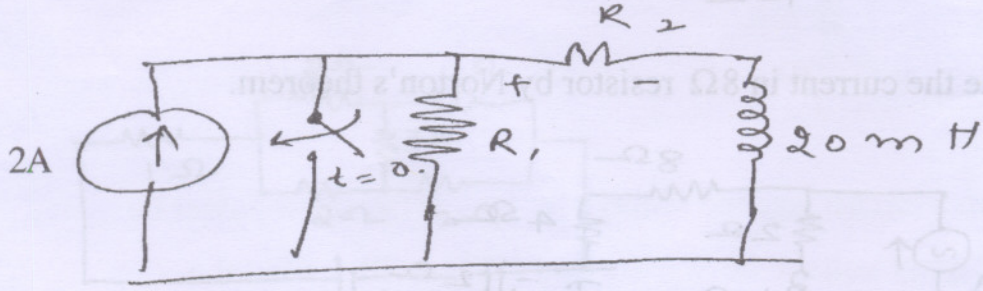
14. a) For the circuit shown below find V_c (t) for all time in the circuit. 5



b) In the circuit shown below let i_e (t) be expressed as the complex response $20e^{j}$ (40 t + 30°) A and express V_s as a complex forcing function. 5



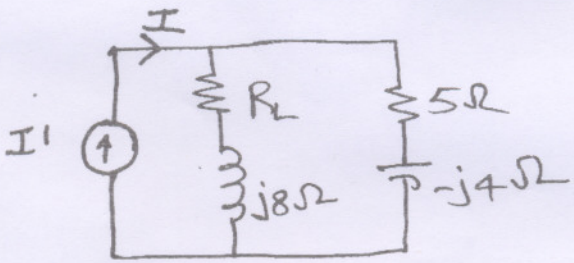
15. a) Select the values of R_1 and R_2 in the circuit shown below so that $V_{R_2}(0^+) = 10$ V and $V_{R_2}(1 \text{ m sec}) = 5$ V. 5



b) A series combination of 12 Ω resistance and 600μ F capacitance is connected to a 220 V, 50 Hz supply. Estimate the current, active power, reactive power and apparent power. Draw the phasor diagram. 5

16. a) A RLC series circuit is to be designed to produce a magnification of 5 at 1000 rad/sec. A 120 V source is connected to RLC series circuit can supply maximum current of 8 A. The half power frequency impedance of the circuit is 32Ω. Find the values of R, L and C. 5

b) Determine the value of R_L for resonance in the network shown. Also calculate the dynamic resistance. 5



17. a) A balanced 3ϕ load is connected to a balanced 3ϕ voltages of 230 volts between lines and is instrumented for power measurement using two wattmeter method. The phase sequence is ABC. The wattmeter in line A reads 2.5 KW and in line B reads 0.5 KW. Calculate the

i) Power factor of the load

ii) Line current and

iii) Load impedances assuming star connection. 5

b) Three identical impedances of $18\angle -30^\circ\ \Omega$ in delta and three impedances of $10\angle 45^\circ\ \Omega$ in star are both connected to same 3ϕ 3 wire, 440 V system. Find the magnitude of line current and total power. 5