

**B.E. DEGREE EXAMINATIONS: NOVEMBER 2009**

Second Semester

**U07EE201: ELECTRIC CIRCUIT ANALYSIS**

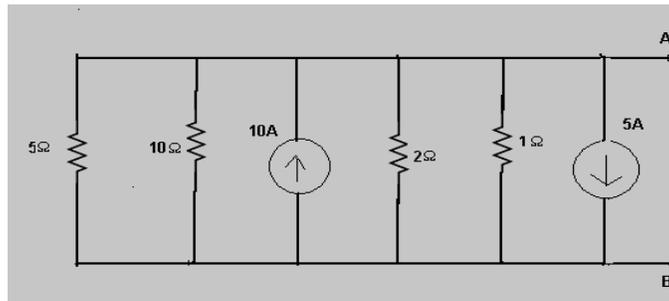
(Common to B.E – Electrical &amp; Electronics Engineering and B.E – Electronics and Instrumentation Engineering)

**Time: Three Hours****Maximum Marks: 100****Answer ALL the Questions:-****PART A (10 x 1 = 10 Marks)**

1. Determine the charge  $C = 0.001 \mu\text{F}$  and  $v=1\text{KV}$ 
  - a) 0.001C
  - b)  $1\mu\text{C}$
  - c) 1C
  - d) 0.01C
2. In a four branch parallel circuit, 10mA of current flows in each branch. If one of the branch opens, the current in each of the other branches
  - a) increases
  - b) decreases
  - c) remains unaffected
  - d) doubles
3. The transient current in a loss free LC circuit when excited from an ac source is an ----- sine wave
  - a) undamped
  - b) over damped
  - c) under damped
  - d) critically damped
4. The transfer impedance is defined as
  - a) the ratio of transform voltage to transform current at the same port
  - b) the ratio of transform voltage at one port to the current transform at the other port
  - c) both (a) and (b)
  - d) the ratio of transform voltage to transform current at the different port
5. In a series RLC circuit operating below the resonant frequency, the current
  - a) I leads  $V_s$
  - b) I lags behind  $V_s$
  - c) I is in phase with  $V_s$
  - d)  $V_s$  leads I
6. If the lower cut-off frequency is 2400 Hz and the upper cut-off frequency is 2800 Hz, what is the bandwidth?
  - a) 400 Hz,
  - b) 2800 Hz
  - c) 2400 Hz
  - d) 5200 Hz
7. The reciprocity theorem is applicable to
  - a) linear networks only
  - b) bilateral networks only
  - c) linear / non-linear networks
  - d) neither of the two
8. Super position theorem is not valid for
  - a) Voltage responses
  - b) current responses
  - c) power responses
  - d) all the three
9. In a three phase unbalanced star connected system, the vector sum of the currents in the three lines is
  - a) Zero
  - b) not zero
  - c) Three times the current in each phase
  - d) Three times the voltage in each phase
10. Dot convention in coupled circuits is used
  - a) to measure the mutual inductance
  - b) to determine the polarity of the mutually induced voltage in the coils
  - c) to determine the polarity of the self induced voltage in coils
  - d) to measure the self inductance

**PART B (10 x 2 = 20 Marks)**

11. A 10A current source has a source resistance of  $100\Omega$ . What will be the equivalent voltage source?
12. A sinusoidal current is given by the equation,  $i(t) = 7.072\sin 314t$  A. what is the rms and average value of current.
13. Define time constant of RC circuit.
14. What is natural and damped frequency?
15. A RC series circuit with  $R=1.2\text{ K}\Omega$  and  $C = 0.1\ \mu\text{F}$  is excited by a sinusoidal source of 45V and frequency 1 KHz. Find the apparent power.
16. What is anti resonance?
17. Find Norton's equivalent of the circuit.



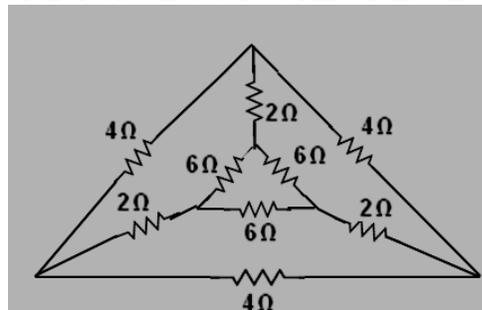
18. State Tellegen's theorem
19. Write the expression for equivalent inductance of two coupled coils connected in parallel?
20. In a 3 wire system, the two line currents of a unbalanced load are  $I_R = 10\angle -67^\circ$  A and  $I_B = 5\angle 136^\circ$  A. Determine line voltage  $I_Y$ .

**PART C (5 x 14 = 70 Marks)**

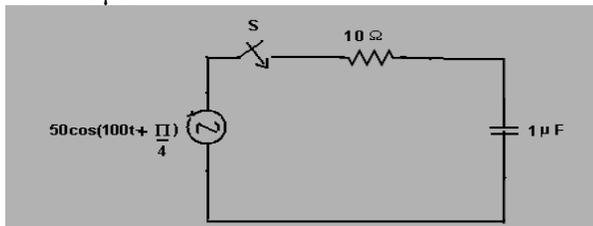
21. a) i) The full wave rectified sine wave has a delay angle of  $60^\circ$  and it has the voltage  $V=10\sin\omega t$  (8)  
ii) Find the average and effective values of the saw tooth waveform. (6)

(OR)

- b) i) A 100W, 250V bulb is put in series with a 40W, 250V bulb across a 500V supply. What will be the current drawn? What will be the power consumed by each bulbs? Will such a combination work. (8)  
ii) Determine the equivalent resistance across AB of the circuit shown in Fig (6)

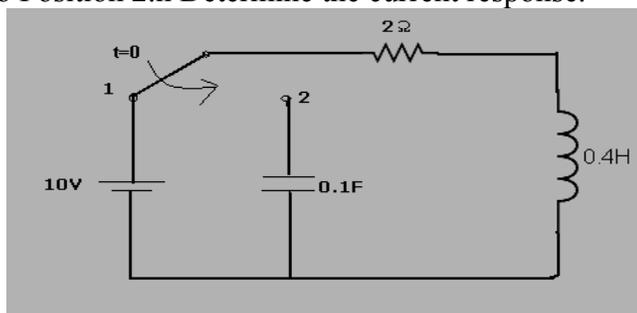


22. a) In the circuit shown in Fig, determine the complete solution for the current when the switch S is closed at  $t=0$ . Applied voltage is  $V(t) = 50\cos(100t + \frac{\pi}{4})$ . Resistance  $R = 10\Omega$  and capacitance  $C = 1\mu F$ .

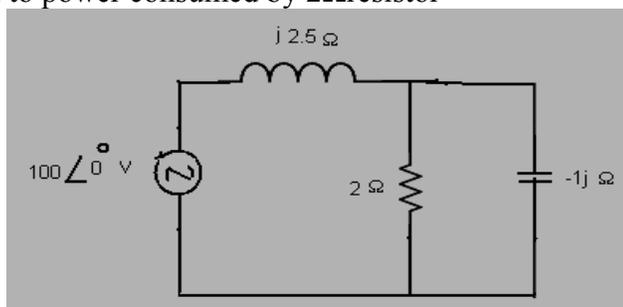


(OR)

- b) In the circuit shown in fig, the switch remains in position 1 for a long time. At  $t = 0$ , the switch is closed to Position 2. Determine the current response.



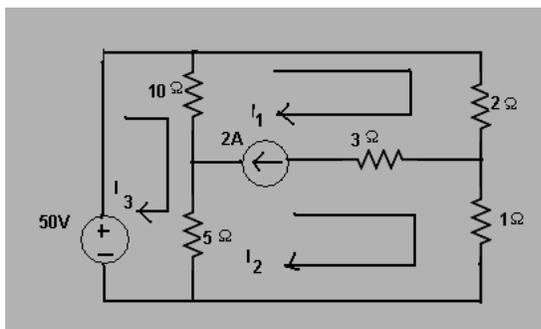
23. a) In the circuit shown in fig determine a) the currents in all the branches, (b) calculate the power and power factor of the source, (c) show that power delivered by the source is equal to power consumed by  $2\Omega$  resistor



(OR)

- b) i) A series RLC circuit consists of a  $50\Omega$  resistor,  $0.2H$  inductance and  $10\mu F$  capacitor with an applied voltage of  $20V$ . Determine the resonant frequency. Find the Q factor of the circuit. Compute the lower and upper frequency limits and also find the bandwidth of the circuit. (8)
- ii) A series RLC circuit has a quality factor of 5 at  $50 \text{ rad/sec}$ . The current flowing through the circuit at resonance is  $10A$  and the supply voltage in the circuit constants. (6)

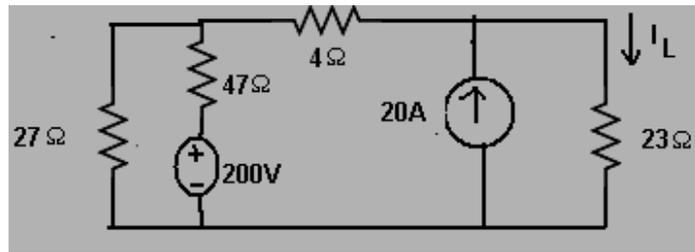
24. a) i) Determine the current in the  $5\Omega$  resistor in the network.



- ii) Explain the maximum power transfer theorem.

(OR)

b) Compute current  $I_L$  in the circuit using super position theorem.



25. a) i) A balanced star connected load of  $(4+j3) \Omega$  per phase is connected to a balanced 3 phase 400V supply. The phase current is 12A. Find (i) the total active power (ii) reactive power and (iii) total apparent power (10)

ii) A primary coil having an inductance of 240mH and the total inductance of the combination is measured as 140mH. Determine coefficient of coupling. (4)

(OR)

b) Two coils are connected in series have an equivalent inductance of 0.8H when connected in aiding and an equivalent inductance of 0.4H when connected in opposing. Determine the mutual inductance. Calculate the self inductance of the coils by taking  $k=0.55$

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