Hall Ticket Number:

Code No. : 13306

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS: EEE) III-Semester Main Examinations, December-2017

Electrical Circuits-I

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2=20 Marks)

1. Explain passive sign convention using suitable example.
2. A Pure inductor acts as a short circuit to DC at steady state. Justify.
3. Draw power triangle and hence define power factor.
4. With respect to an Alternating Quantity, differentiate between frequency and angular velocity 'ω'.
5. Find by superposition theorem current through 4Ω resistor for the circuit shown in fig.1

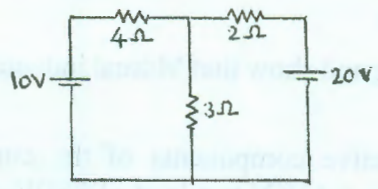

Fig.1

6. State Tellegan's theorem as applied both ac & dc networks.
7. Define Q factor. What is its significance?
8. Is resonant frequency dependent on circuit resistance? Comment.
9. Deduce the relationship between line & phase quantities in a 3□ Star system.
10. Explain the concept of mutual inductance with respect to a transformer.

Part-B (5 × 10 = 50 Marks)

11. a) Derive for the energy stored in an inductance. [3]

    b) A pure inductance of 3 mH carries a current of the wave form shown in fig.2 Sketch the wave forms of v(t) & p(t). Also determine the average power consumed by the inductor [7]

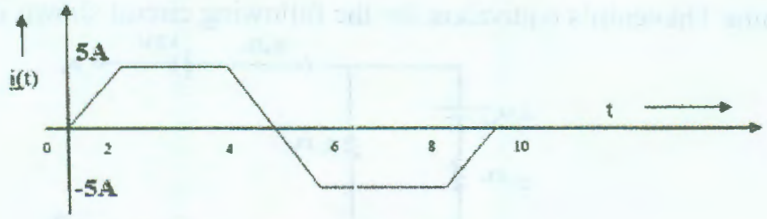

Fig.2

12. a) Perform steady state analysis for a pure capacitor and hence show that the power factor is zero lagging. [5]

    b) A series circuit consisting of a 10 Ω resistor, a 100 μF capacitance and a 10 mH inductance is driven by an AC source of 100V, 50 Hz. Calculate the equivalent impedance, current, power factor & power dissipated in the circuit. [5]

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13. a) State and explain Reciprocity theorem. [5]

b) By Norton's theorem find the current through 5Ω resistor for the circuit shown in fig.3. [5]

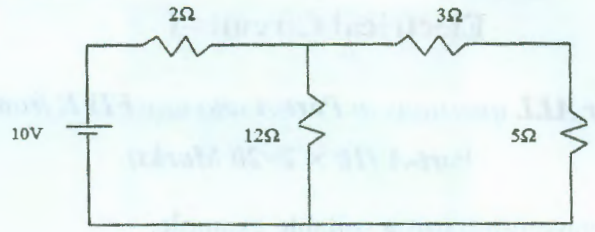

Fig. 3

14. a) Draw the current locus of a network having fixed resistance & variable capacitance. [5]

b) A series RLC with 10 Ω, 1 mH& 1 μF is connected across a sinusoidal source of 20 V & variable frequency. Determine: [5]

i. The resonant frequency
ii. Q factor
iii. Half power frequencies

15. a) Explain coefficient of coupling and show that Mutual inductance is directly dependant on this factor. [4]

b) Calculate the active and reactive components of the current in each phase of a star connected generator supplying at 11KV to a load of 5MW at 0.8 pf lagging. What is the value of new output if the total current is same and the pf is raised to 0.85? [6]

16. a) By taking an example explain the concept of a Super node. [5]

b) Find form factor for the waveform shown in fig.4. [5]

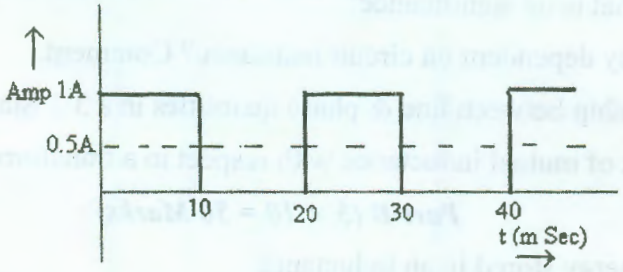

Fig.4

17. Answer any ***two*** of the following: [5]

a) Determine Thevenin's equivalent for the following circuit shown in fig.5.

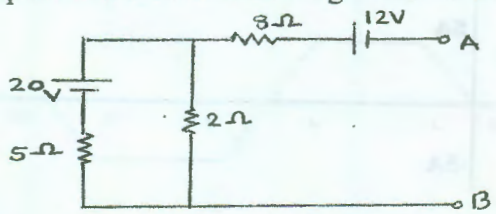

Fig.5

b) Show that quality factor (Q) = $\frac{\omega_0}{BW}$ for a series RLC circuit. [5]

c) A star connected load with $Z_R = 10\angle 0^0\ \Omega$, $Z_Y = 10\angle 60^0\ \Omega$ and $Z_B = 10\angle -60^0\ \Omega$ is connected to a 3-phase 3-wire 400 V RYB system. Find the voltages across the load impedances V_{RO}, V_{YO}, V_{BO} and V_{ON}. [5]

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