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Ex/EE/T/111/2018(S) old

BACHELOR OF ENGINEERING IN

ELECTRICAL ENGINEERING EXAMINATION, 2018

(1st Year, 1st Semester, ~~Supplementary~~ old)

PRINCIPLES OF ELECTRICAL ENGINEERING - I

Time: Three Hours | Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-I

Answer *any three* questions

Two marks are reserved for neatness and well organized answer script

1.a) Derive the relationship between the voltage and current for a purely capacitive circuit. Also show that the average power consumed by the capacitive circuit is zero. Draw the appropriate phasor diagram showing voltage and current relationship. 6

b) Calculate the rms and average values of current i represented by Fig.1

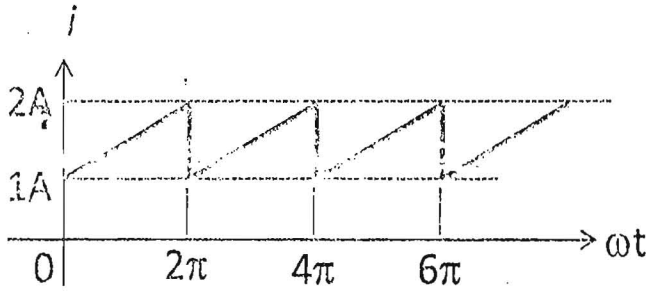

Fig.1

6

c) Explain the term apparent power, active power, reactive power and power factor. 4

2. a) A load consumes 7.5KW at a lagging power factor of 0.6 when connected to a 230V, 50Hz power line. Find the value of capacitor to raise the power factor to 0.85. Show associated phasor diagram. 8

b) A voltage of 230 V at 50 Hz is applied across a non-inductive resistor connected in series with a capacitor. The current in the circuit is 1.2 A. The power loss in the resistor is 52.8 W. Assume that power loss in the capacitor is negligible. Calculate the resistance and capacitance. 8

[Turn over

3. a) From dimensional analysis, show that

i) $\sqrt{\frac{L}{C}}$ is dimensionally same as R.

ii) CR has the unit of time. 8

b) Find the value of total resistance between the terminals A and B of the circuit given in Fig. 2.

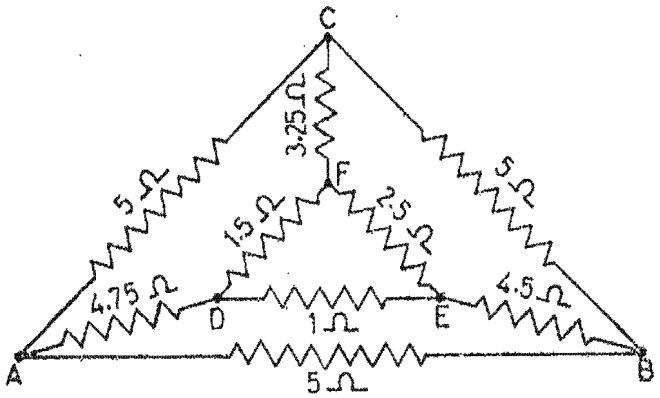

Fig. 2

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4. a) Find out Thevenin's equivalent circuit across terminals A and B of the network given in Fig. 3. All resistances are in ohm and current through 20 ohm resistor is 8A. 8

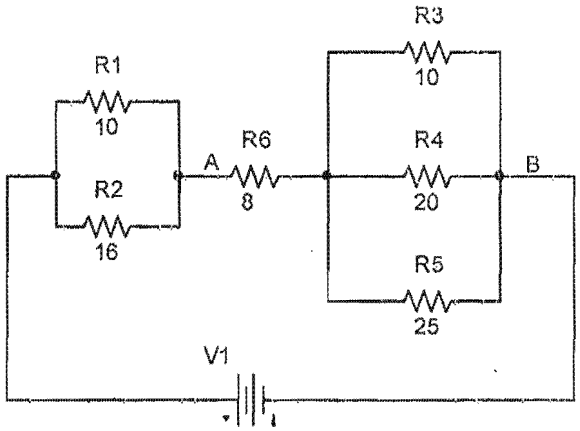

Fig. 3

b) State maximum power transfer theorem considering a circuit with ac source with fixed source impedance delivering power to a load consisting of variable complex impedance. 8

5. Write short notes on any ***two***: 8×2

a) Resonance in series R-L-C circuit.

b) Star-delta conversion of impedances.

c) Thevenin's and Norton's theorem and their relation.

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BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMESTER SUPPLEMENTARY EXAM – 2018

Subject: PRINCIPLES OF ELECTRICAL ENGINEERING-I

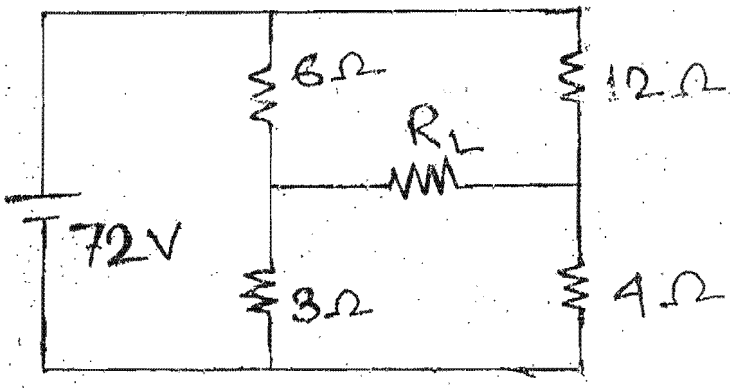
Time: Three Hours | Full Marks: 100

Use separate Answer script for each part
PART-II (50 marks)
Answer any Three Questions
(Q. No. 1 carries 18 marks)

1. a) Define biot (Bi). Find the dimensions of Electric Potential (V) and Magnetic Flux (Φ) in emu unit system. 2+4=6

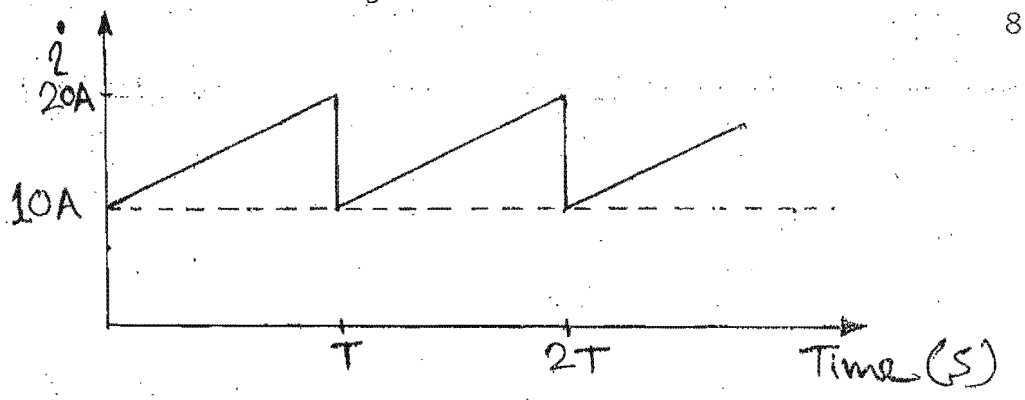
b) A circuit consists of resistance R, and capacitive reactance Xc and connected across $115V, 50\,Hz$ supply and takes $0.8A$ current at a power factor of 0.3 leading. Find the value of R and Xc. 6

c) Find the Thevenin's equivalent network for given the network. 6



2. a) State and explain the Superposition Theorem. Find the dimensions of i) CR^2 & ii) $\frac{L}{R}$ in MKS unit system. 4+4=8

b) Find the *r.m.s.* and *average* value of current wave as shown below- 8



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BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMESTER SUPPLEMENTARY EXAM – 2018

Subject: PRINCIPLES OF ELECTRICAL ENGINEERING-I

Time: Three Hours | Full Marks: 100

3. a) Discuss the effect of varying frequency upon the current drawn and power factor in a RLC series circuit.

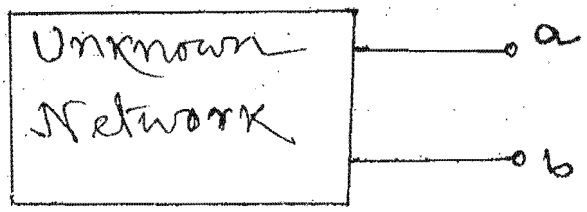
4

b) Show that a non-ideal current source can be replaced by a non-ideal voltage source with similar V-I characteristics.

4

c) In the below network, the voltage across terminals a & b is $200V$ (when they remain opened). When a & b are shorted, the current flowing through sorting is $10A$. i) Find the value of resistance that should connected across a & b, so that $5A$ current flowing through that resistance. ii) Find the value of the resistance such that power delivered to the resistance is maximum. iii) Also find the maximum power that can be transferred to the resistance calculated in ii).

8



4. a) Derive the $r.m.s.$ and *average* value of the Half Wave Rectified current.

8

b) An alternating current varying sinusoidally with a frequency of 50 Hz. It has a r.m.s. value of $10A$. Write down the equation for the instantaneous value and find this value for i) $0.0025\,sec$, ii) $0.125\,sec$ after passing through a positive maximum value. At what time measured from a positive maximum value, will the instantaneous current be $7.07A$.

8

5. a) Show that the power consumed by a pure capacitor over a full cycle of applied sinusoidal voltage is zero.

4

b) A coil of resistance 50Ω and inductance $0.12H$ is connected in series with a capacitance of $80\mu F$ across $230V, 50Hz$ supply. Calculate i) the current in the circuit, ii) the potential differences across each element and iii) the frequency at which the current would have unity power factor.

8

c) For a RLC series circuit, discuss the nature of power factor for i) $X_L > X_C$ and ii) $X_L < X_C$ with suitable phasor diagram.

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