

## B.Tech 2nd Semester Exam., 2016

## BASIC ELECTRICAL ENGINEERING

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The questions are of equal value.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer from the following (any seven) :

(a) The power dissipation in each of three parallel branches is 1 W. What is total power dissipation of the circuit?

- (i) 1 W
- (ii) 4 W
- (iii) 3 W
- (iv) Zero

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(b) The number of independent loops for a network with  $n$  nodes and  $b$  branches is

- (i)  $n-1$
- (ii)  $b-n$
- (iii)  $b-n+1$
- (iv) independent of number of nodes

(c) Superposition theorem is valid only for

- (i) linear circuit
- (ii) non-linear circuit
- (iii) Both (i) and (ii)
- (iv) Neither of two

(d) A sine-wave voltage is applied across inductor. When the frequency of voltage is increased, the current

- (i) increases
- (ii) decreases
- (iii) remains same
- (iv) becomes zero

(e) The frequency of applied voltage in series RLC circuit is increased, what happens to the inductive reactance?

- (i) Decreases
- (ii) Remains same
- (iii) Increases
- (iv) Becomes zero

(f) In a certain RC circuit, the true power is 2 W, and reactive power is 3.5 VAR. What is the apparent power?

- (i) 3.5 VA
- (ii) 2 VA
- (iii) 4.03 VA
- (iv) 3 VA

(g) In complex impedance circuit, the maximum power transfer occurs when the load impedance is equal to

- (i) complex conjugate of source impedance
- (ii) source impedance
- (iii) source resistance
- (iv) None of the above

(h) In parallel resonance circuit, why does current lag behind the voltage at frequencies below resonance?

- (i) Because the circuit is predominantly resistive
- (ii) Because the circuit is predominantly inductive
- (iii) Because the circuit is predominantly capacitive
- (iv) None of the above

(i) In two wattmeter method of power measurement, when  $\text{pf} = 0.5$

- (i) the readings of two wattmeters are equal and positive
- (ii) the readings of two wattmeters are equal and opposite
- (iii) the total power is measured by only one wattmeter
- (iv) None of the above

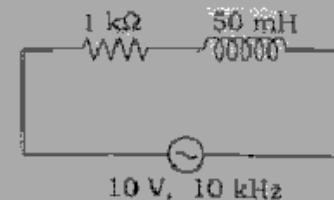
(j) Two coils connected in series have an equivalent inductance are connected in aiding. If the self-inductance of first coil is 1 H, self-inductance of second coil (Assume  $M = 0.5 \text{ H}$ ) will be

- (i) 1 H
- (ii) 2 H
- (iii) 3 H
- (iv) 4 H

(a) Define—

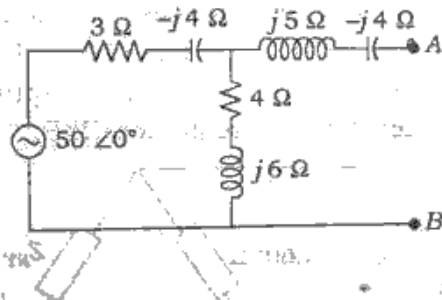
- (i) average value;
- (ii) RMS value;
- (iii) peak factor.

(b) The circuit shown in figure below consists of  $1 \text{ k}\Omega$  resistor in series with  $50 \text{ mH}$  coil,  $10 \text{ V}$  r.m.s.,  $10 \text{ kHz}$  signal is applied. Find the impedance  $Z$ , current  $I$ , phase angle  $\theta$ , voltage across resistance  $V_R$ , voltage across inductance  $V_L$ .



- 3/ (a) Explain power triangle giving suitable phasor diagram.
- (b) Two impedances  $Z_1 = 10 \angle -60^\circ \Omega$  and  $Z_2 = 16 \angle 70^\circ \Omega$  are in series and pass an effective current of 5 A. Determine the active power, reactive power, apparent power and power factor.

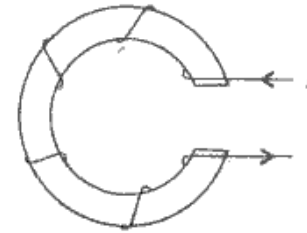
4. For the circuit shown in figure below, determine Thevenin's equivalent between the output terminals AB.



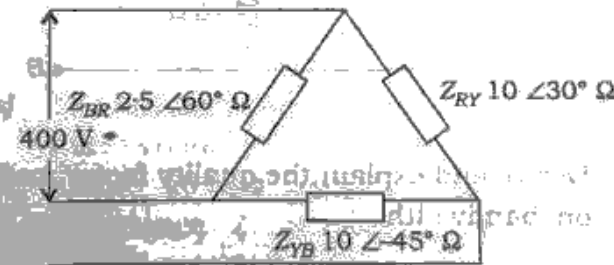
5. Derive and explain the quality factor and its effect on bandwidth.

6. (a) Define composite series circuit.
- (b) Calculate the mmf required to produce a flux of 5 mWb across an air gap of 2.5 mm of length having an effective area of  $100 \text{ cm}^2$  of a cast steel ring of mean iron path of 0.5 m and cross-sectional area of  $150 \text{ cm}^2$  as

shown in figure below. The relative permeability of cast steel is 800. Neglect leakage flux.



7. A symmetrical 3- $\phi$ , 3-wire, 400 V, supply is connected to delta-connected load as shown in figure below. Impedances in each branch are  $Z_{RY} = 10 \angle 30^\circ \Omega$ ,  $Z_{YB} = 10 \angle -45^\circ \Omega$  and  $Z_{BR} = 2.5 \angle 60^\circ \Omega$ . Find its equivalent star-connected load in sequence RYB.



8. (a) Explain energy-meter.
- (b) An energy meter is designed to make 100 rev/kWh of energy. It is connected to load carrying 20 A at 230 V at 0.8 pf for an hour. The energy meter actually makes 362 revolutions. Find percentage error.

9. (a) Explain moving-iron instruments.

(b) A 220 V/110 V, 60 Hz transformer has a total no-load loss of 800 W while drawing 3.5 A current at 220 V. The primary winding resistance is  $0.54 \Omega$ . From the manufacturer's core-loss data, hysteresis loss at 60 Hz was found to be 520 W. If the operating voltage and frequency are doubled, calculate the new core losses.

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