

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2301

Roll No.

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B. Tech.

(Semester-I) Theory Examination, 2011-12

ELECTRICAL ENGINEERING

Time : 3 Hours]

[Total Marks : 100

Note : Attempt questions from all Sections. Assume missing data if any.

Section-A

1. Answer *all* parts in few sentences/words : $2 \times 10 = 20$
 - (i) What do you mean by 'linear bilateral circuit'?
 - (ii) Enlist the properties of voltage and current sources.
 - (iii) What is the use of condenser in single phase AC motor?
 - (iv) Define form factor in AC circuit.
 - (v) What happens if the field winding of a running shunt motor suddenly breaks open?

- (vi) A series circuit has $R = 10\ \Omega$, $L = 0.01\ \mu$ and $C = 10\ \mu\text{F}$. Calculate Q -factor of the circuit.
- (vii) Write the condition for efficiency in transformer to be maximum.
- (viii) Name the meter used for measurement of electrical energy of consumer.
- (ix) Two wattmeter method for three phase power measurement is universal one. Why?
- (x) Write an expression of hysteresis loss in a transformer.

Section-B

2. Answer any *three* parts of the following : $10 \times 3 = 30$

- (a) Using superposition theorem, find the current flowing through resistor R in Fig. 1.

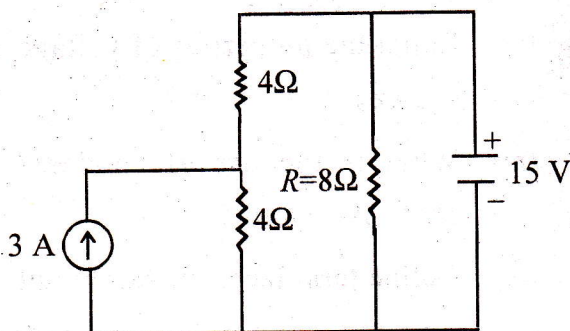


Fig. 1

- (b) A metal-filament lamp, rated at 750 W, 100 V is to be connected in series with a capacitor across 230 V, 50 Hz supply. Calculate the value of capacitance required. Draw phasor diagram of the circuit.
- (c) An electromagnet has an gap of 4 mm and flux density in the gap is 1.3 Wb/m^2 . Determine the ampere-turns for the gap.
- (d) A three-phase delta connected 440 volts, 50 Hz, 4-pole induction motor has a rotor stand-still emf per phase of 130 volts. If the motor is running at 1440 rpm, calculate slip, frequency of rotor induced emf, the value of the rotor induced emf per phase and stator to rotor turn ratio for same speed.
- (e) In a 2-wattmeter method, power measured was 30 kW at 0.7 pf lagging. Find the reading of each wattmeter.

Section-C

Answer *all* questions of this section : $10 \times 5 = 50$

3. Answer any *two* parts of the following :

- (a) A 100 V, 60 Watt bulb is to be operated from 220 V supply. What resistance must be connected in series with the bulb to glow normally?
- (b) Using Mesh analysis, calculate the currents I_1 and I_2 in Fig. 2.

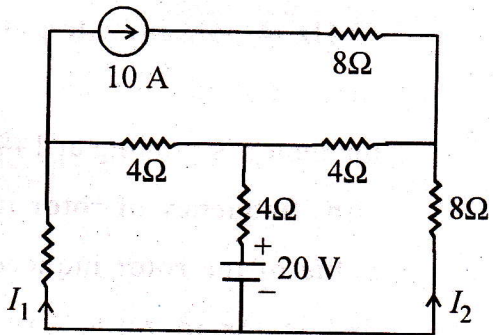


Fig. 2

- (c) State and explain maximum power transfer theorem for DC circuit.

4. Answer the following :

- (a) For an AC circuit, the voltage and current are given by :

$$v = 200 \sin 377 t \text{ volts, and}$$

$$i = 8 \sin (377 t - 30^\circ) \text{ amperes.}$$

Determine the power factor, true power, apparent power and reactive power of the circuit. Also cross verify from power triangle.

- (b) Derive an expression for the resonance frequency of the parallel resonance circuit, one branch consisting of inductor L , resistance R and other branch contain capacitor C . Also draw the phasor diagram for the same.

5. Answer the following :

- (a) Describe deflecting torque, controlling torque and damping torque in measuring instruments. How range is extended in moving coil ammeter and voltmeter.

- (b) Derive the relationship between line and phase current for a delta and star connected 3-phase balanced system.

6. Answer any *two* parts of the following :

- (a) Define substation, feeders, distributors, service mains and local distribution station in power system.
- (b) A voltage $v = 200 \sin 314 t$ is applied to the transformer winding in a no-load test. The resultant current is found to be $i = 3 \sin(314t - 60^\circ)$. Determine the core-loss and the parameters of no-load approximate equivalent circuit.
- (c) What do you understand by self-inductance? Derive its expression.

7. Answer any *two* parts of the following :

- (a) Explain the generator action of a DC machine. Also describe the open circuit characteristics of DC generator.

- (b) Explain the speed-torque characteristics of a DC shunt and series motors.
- (c) Three-phase induction motor is self starting but 3-phase synchronous motor is not self-starting. Explain, why? Enlist application of 3-phase synchronous motor.