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Printed Pages--6

TEE-101

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

PAPER ID : 2018

Roll No.

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FIRST

B.Tech.

FIRST SEMESTER EXAMINATION, 2005-2006

ELECTRICAL ENGINEERING

Time : 3 Hours

Total Marks : 100

- Note :** (i) Answer **ALL** questions.
(ii) All questions carry equal marks.
(iii) Be precise in your answer.

1. Attempt **any four** of the following questions : (4x5=20)

- (a) An a.c. Voltage $e(t) = 141.4 \sin 120t$ is applied to a series R-c circuit. The current through the circuit is obtained as

$$i(t) = 14.14 \sin 120t + 7.07 \cos (120t + 30)$$

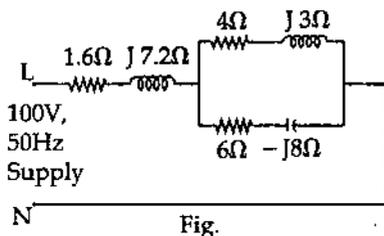
Determine (i) values of resistance and capacitance

(ii) power factor

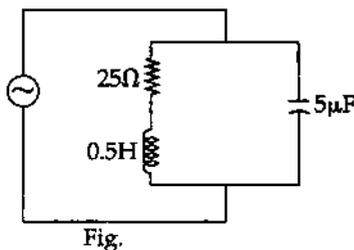
(iii) power delivered by the source

- (b) A non-inductive resistance of 10 ohms is connected in series with an inductive coil across 200V, 50Hz ac supply. The current drawn by the series combination is 10 amperes. The resistance of the coil is 2 ohms. Determine (i) inductance of the coil (ii) Power factor (iii) Voltage across the coil.

- (c) The following figure shows a series-parallel circuit. Find :
- Admittance of each parallel branch
 - Total circuit impedance
 - Supply current and power factor
 - Total power supplied by the source.



- (d) Discuss why ?
- At resonance the current is maximum in a series circuit and minimum in a parallel circuit.
 - In a series RLC circuit, the voltages across L and C at resonance may exceed even the supply voltage
 - The shape of resonance curve depends on Q of the coil.
- (e) For the circuit shown below, determine
- Resonant frequency
 - Total impedance of the circuit at resonance
 - Bandwidth
 - Quality factor.



- (f) What is hysteresis loop and what information is obtained from this loop? Draw hysteresis loop for
- Permanent magnet
 - Transformer core
 - Ferrite

2. Attempt *any four* of the following questions : (4x5=20)

- (a) Using mesh current method, determine current I_x in the following circuit :

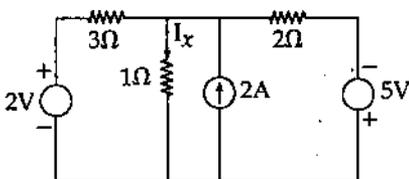


Fig.

- (b) Using superposition theorem, determine currents in all the resistances of the following network :

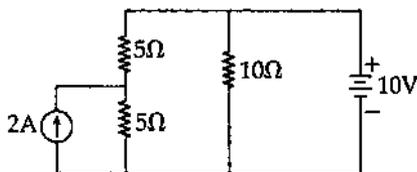


Fig.

- (c) Determine current in 10 ohm resistance using Norton's theorem in the following network :

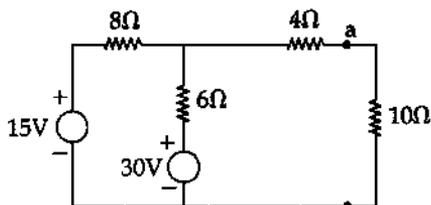


Fig.

- (d) State maximum power transfer theorem. For which type of circuits is it generally applied? Derive condition for maximum power transfer to a purely resistive load.
- (e) Explain in brief the working principle of permanent magnet moving coil instruments. Why is the scale linear?
- (f) Compare merits and demerits of moving iron instrument and dynamometer type instrument. Which one is superior and why?

3. Attempt *any two* of the following questions : (10x2=20)

- (a) A star connected three phase load has a resistance of 8 ohms and an inductive reactance of 6 ohms in each phase. It is fed from a 400V, three phase balanced supply. Determine line current, power factor, active and reactive powers. Draw phasor diagram showing phase and line voltages and currents. If power measurement is made using two wattmeter method, what will be readings of both wattmeters?
- (b)
 - (i) Draw and explain phasor diagram of single phase transformer on load with lagging power factor.
 - (ii) A 30kVA, 2000/200V, single phase, 50Hz transformer has a primary resistance of 3.5 ohms and reactance of 4.5 ohms. The secondary resistance and reactance are 0.015 ohms and 0.02 ohms respectively. Find (i) equivalent resistance, reactance and impedance referred to the primary side
(ii) Total copper losses in the transformer.

- (c) The following readings were obtained from o.c. and s.c. tests on 8kVA, 400/100V, 50Hz transformer :

O.C Test (L.V. Side) : 100V, 4A, 60W

S.C. Test (H.V. Side) : 10V, 20A, 100W

Calculate (i) Voltage regulation at full load and 0.8 power factor lagging (ii) efficiency at half load and 0.8 power factor lagging

4. Attempt *any two* of the following questions : (10x2=20)

- (a) (i) Explain principle of electro mechanical conversion in motor and generator.
- (ii) Draw magnetization characteristics of a dc shunt generator. Give reasons why this generator may fail to build up voltage.
- (b) A dc shunt generator running at 1200 r.p.m supplies a load of 60kW at 250 Volts. Find the speed at which it runs as a shunt motor when taking 60kW from 250Volts supply. Take armature resistance as 0.1 Ohm and field winding resistance as 50 ohm. Neglect brush drop.
- (c) Explain principle of operation of a three phase synchronous motor. Why is starting torque not produced in this motor ?

5. Attempt *any two* of the following questions : (10x2=20)
- (a) (i) Draw torque-slip characteristics of a three phase induction motor indicating therein the starting torque, the maximum torque and the operating region (ii) Discuss the effect of variation of rotor resistance and supply voltage on the torque-slip characteristics. (iii) State the operating conditions of the motor when the slip is either positive greater than one or negative. (iv) A 12-pole, 3-Phase alternator is coupled to an engine running at 500 r.p.m. It supplied a 3-phase induction motor having a full load speed of 1440 r.p.m. Find the percentage slip, frequency of rotor current and no. of poles of the motor.
- (b) Why starters are necessary for starting of three phase induction motors ? Describe with the help of diagram, the rotor resistance starter for three phase slip ring induction motor. Mention its merits in comparison to other type of starters.
- (c) Explain principle of operation of a single phase induction motor using two revolving field theory. List various methods of starting.

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