

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

PAPER ID : 2018

Roll No.

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B.Tech.

(SEM. I) THEORY EXAMINATION 2010-11

ELECTRICAL ENGINEERING

Time : 3 Hours

Total Marks : 100

Note : Attempt all questions.

1. Attempt any **four** parts of the following : (5×4=20)

(a) Two alternating currents represented by the equations

$$i_1 = 7 \sin \omega t \text{ and } i_2 = 10 \sin \left(\omega t + \frac{\pi}{3} \right) \text{ are fed into a common}$$

conductor. Find the equation for the resultant current and its rms value.

(b) A coil in parallel with a 200 μF capacitor is connected across a 200 V, 50 Hz Supply. The coil takes a current of 8 A and loss in the coil is 960 W. Calculate the following :

(i) Resistance of the coil

(ii) Inductance of coil

(iii) Power factor of entire circuit.

(c) Derive the expression of resonant frequency for a series R-L-C. circuit. Why series resonant circuit is called as an acceptor circuit ? Explain bandwidth and quality factor of series resonant circuit.

(d) Draw a magnetisation curve and define the hysteresis and eddy current losses. On what factors these losses depends ?

- (e) An iron ring has a mean circumferential length of 60 cm with an airgap of 1 mm and a uniform winding of 300 turns. When a current of 1 A flows through the coil, find the fluxdensity. The relative permeability of iron is 300. Assume $\mu = 4\pi \times 10^{-7}$ H/m.

Attempt any **four** parts of the following : (5×4=20)

- (a) Three resistances r , $2r$ and $3r$ are connected in delta, then calculate the equivalent values of these resistances in star connection. Prove formula used.
- (b) Find Norton equivalent circuit for the network shown Fig. 1.

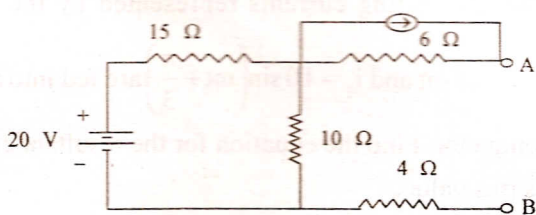


Fig. 1

- (c) State and explain super position theorem. Determine current through 6Ω resistor. Fig. 2

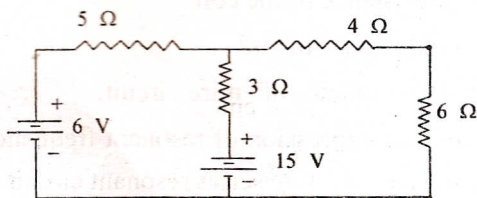


Fig. 2

- (d) Explain the difference between moving coil and moving iron instruments.

A moving coil ammeter has a resistance of 0.01Ω and full scale deflection current of 0.25 A . How this meter can be made to read :

- (i) Voltage upto 250 V
 - (ii) Current upto 20 A ?
- (e) Explain the working principle of an induction type wattmeter with the help of a diagram.

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) Compare 3 phase star and delta connected systems. Show that total power in these connection remains same. A balanced 3 phase star connected load takes a power of 5 kW at 0.8 pf lagging when connected to a 400 V , 3 phase supply. Calculate the line current and impedance per phase of the load.

(b) Explain the principle of operation of a single phase transformer.

A $230/460 \text{ V}$ transformer has a primary resistance of 0.2Ω and a reactance of 0.5Ω and the corresponding values for the secondary are 0.75Ω and 1.8Ω respectively. Find the secondary terminal voltage when supplying

- (i) 10 A at 0.8 p.f. lagging
- (ii) 10 A at $\text{p.f. } 0.8$ leading.

(c) Following results were obtained on a 100 kVA, 11,000/220 V single phase transformer :

- (i) OC test 220 V, 45 A, 2 kW
- (ii) SC test 500 V, 9.09 A, 3 kW.

Determine equivalent circuit parameters of the transformer referred to low-voltage side.

4. Attempt any **three** parts of the following : $(6 \frac{2}{3} \times 3 = 20)$

- (a) Explain working of different parts of D.C. machine. Derive emf equation across the armature terminals of D.C. generator.
- (b) Explain load characteristics of D.C. generators. Why terminal voltage falls by increasing the load ?
- (c) Describe the voltage build up process in D.C. Shunt generator. Write conditions of voltage build up failure.
- (d) A 200 V dc series motor runs at 500 rpm when taking a current of 25 A. The resistance of the armature is 0.5Ω and that of field is 0.3Ω . If the current remains constant, calculate the resistance necessary to reduce the speed to 250 rpm.

5. Attempt any **four** parts of the following : $(5 \times 4 = 20)$

- (a) Draw torque slip characteristics of 3 phase induction machine. Draw it for different rotor resistances.

- (b) Explain starting of 3 phase step ring induction motor.
- (c) Why single phase induction motor is not self starting ?
Explain various starting methods.
- (d) A 12 pole, 3 phase alternator driven at a speed of 500 rpm supplies power to an 8 pole, 3 phase induction motor. If the slip of the motor is 0.03 pu, calculate the speed of the motor.
- (e) Give the applications of the following :
- (i) Single phase Induction motor
 - (ii) Synchronous motor
 - (iii) Three phase Induction motor
 - (iv) D.C. series motor
 - (v) D.C. shunt motor.