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Printed Pages : 7 **TEE – 201**

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

PAPER ID : 2019 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. II) EXAMINATION, 2007-08

ELECTRICAL ENGG.

Time : 3 Hours] *[Total Marks : **100***

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

(a) An alternating voltage is V=100 sin 100 t ; *find*

(i) Amplitude

(ii) Time period and frequency

(iii) Angular velocity

(iv) Form factor

(v) Crest factor.

(b) Determine the following in the circuit shown in **Fig 1b**.

(i) The current phasors I, I_1 and I_2.

(ii) Active Power dissipated in the three resistive branches.

(iii) Power factor of the circuit.

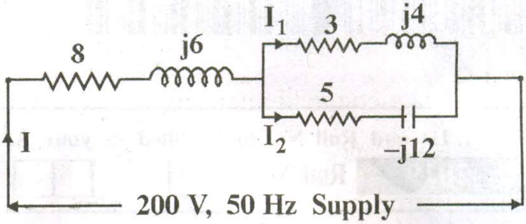

Fig. 1b

(c) Explain the concept of bandwidth and quality factor for a series R-L-C circuit. Derive their expressions.

(d) Establish the analogy between electric and magnetic circuits.

(e) An effective voltage of 100 V is applied to the parallel combination of two impedances $\bar{Z}_1 = R_1 + jX_1$ and $\bar{Z}_2 = R_2 + jX_2$. Assume that $R_1 = 3\,\Omega$ and $R_2 = 4\,\Omega$ and the magnitude of the two branch currents are same; determine the values of X_1, X_2 and the resultant source current.

(f) A ring of ferromagnetic material has a rectangular cross section. The inner diameter is 7.4 in., the outer diameter is 9 in., and the thickness is 0.8 in. There is a coil of 600 turns wound on the ring. When the coil carries a current of 2.5A, the flux produced in the ring is $1.2 \times 10^{-3} Wb$.

Find :

(i) Magnetic field intensity

(ii) Reluctance

(iii) Permeability.

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

(a) Find the currents in all the resistive branches of the circuit shown in **Fig 2.a** by

(i) KVL

(ii) KCL

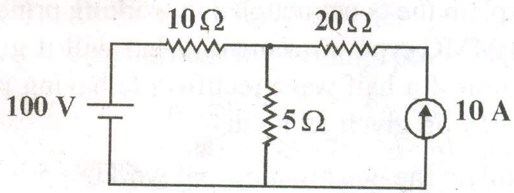

Fig. 2.a

(b) Determine the value of current through the **5 Ω** resistance using Norton's theorem in the circuit shown in **fig 2.b**. State whether superposition theorem can be applied for the circuit with reasons.

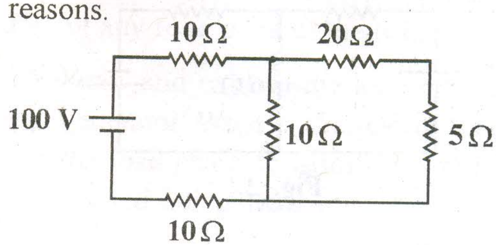

Fig. 2.b

(c) In the network shown in **Fig 2.c** find

(i) The value of RL for maximum power dissipation.

(ii) The value of the maximum power.

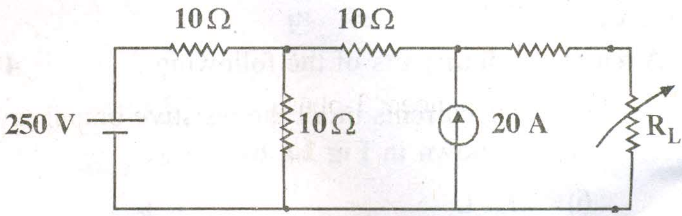

Fig. 2c

(d) Explain the construction and working principle of a PMMC type instrument. What will it give as output if a half wave rectified ac having peak value of 100 is given as input ?

(e) Explain the construction and working principle of a Moving Iron attraction type instrument. Why is its scale non-uniform?

(f) In the circuit shown in **fig 2.f**, find the current through the 6 Ω register using superposition theorem.

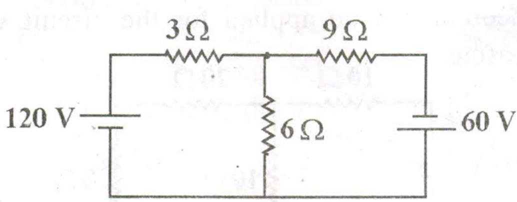

Fig. 2.f

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

(a) Derive and explain the two Wattmeter method of measurement of three phase power for a balanced star connected load. How is the three phase power determined? Discuss the variations in readings for different power factors of loads from unity to zero.

(b) A balanced 3-phase star-connected load of 180 kW taking a leading current of 60 amperes when connected across a 3-phase 440 V, 50 Hz supply. Find the values and nature of the load components and also power factor of the load.

(c) Draw the phasor diagram of a single phase transformer for leading power factor load.

The efficiency of a 400 kVA, single phase transformer is 98.77% at full load 0.8 power factor and 99.13% at half full load unity power factor.

Find :

(i) Iron losses at full and half full-loads

(ii) Cu losses at full and half full loads.

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

(a) Draw and explain the load characteristics of a DC generator. What is the reason for the difference in the load characteristics for a self and separately excited DC generator ?

(b) Derive the EMF equation of a DC generator. What are Lap and Wave windings? Which among them is used for high current and which for high voltage DC generator?

(c) A DC generator (self-excited) fails to build up. Discuss the reasons and remedies for the problem.

(d) Briefly explain the various speed control methods of a DC motor. Which one of them is called constant torque method and why?

(e) A DC shunt motor runs at 600 rpm taking 60 A from a 230 V supply. Armature resistance is 0.2 ohm and field resistance is 115 ohms. Find the speed when the current through the armature is 30A

(f) Draw and explain the torque-speed, torque-current and speed current characteristics of a DC series motor. Give two applications of the DC motor.

5 Attempt any **two** parts of the following: **2×10=20**

(a) Derive and draw the torque-slip characteristics of a 3-phase Induction motor. Show, the Breaking and Generating regions explaining the particular values of slips in these two regions.

(b) Explain power flow in a 3-phase Induction Motor. Derive the relationship

$$\mathbf{P_g : P_{mech} : P_{cu} = 1 : (1\text{-}S) : S}$$

Why is the core loss neglected in the rotor circuit of a 3-phase induction motor?

(c) Write short notes on the following :

(i) How the motors generally used in ceiling fans of daily use, are made self starting?

(ii) Rotating magnetic field in a 3-phase induction motor.

(iii) Induction motor as a transformer.
