* Z - 2 0 1 8 / 2 0 1 9 - 5 0 0 0 *

Printed Pages : 7 TEE – 101/201

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

PAPER ID : 2018/2019 Roll No.

B. Tech. (Sem. I & II)

SPECIAL CARRYOVER EXAMINATION, 2006-07

ELECTRICAL ENGINEERING

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

Notes : *(1) Answer **all** the **five** questions.*

*(2) All questions carry **equal** marks.*

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

(a) A circuit consists of three parallel branches. The branch currents are represented by

$$i_1 = 10\sin(\theta - 45^\circ)$$

$$i_2 = 15\cos\theta$$

$$i_3 = 20\sin(\theta + 60^\circ)$$

Find the resultant current and express it in the form $i = I_m \sin(wt \pm \alpha)$ and draw the phasor diagram.

(b) A coil has an inductance of 19 mH and a resistance of 8 ohm. It is connected to a sinusoidal supply of 200 V, 50 Hz.

Calculate

(i) the impedance

(ii) the supply current

(iii) the power factor

(iv) the power consumed

(v) the reactive volt-ampere.

(c) For the circuit shown in **fig. 1**, calculate

(i) the equivalent impedance

(ii) the supply current

(iii) the supply power factor

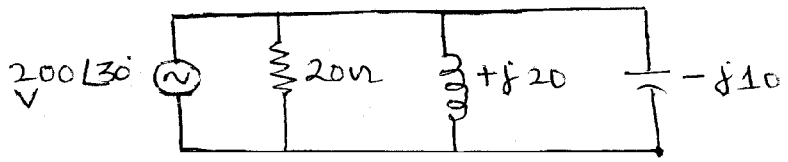

Fig. 1

(d) Explain the terms "Resonant frequency", "Quality factor" and "Bandwidth" related to a series R-L-C a.c. circuit. How are these terms related to each other ? What is the significance of high Q-factor ?

(e) A coil of resistance 50 ohm and inductance 0.5 H is connected in parallel with a capacitor of **100** μF. Calculate the frequency at which the circuit acts as a non-inductive resistance using basic concept. Calculate the value of this non-inductive resistance and the bandwidth.

(f) Explain analogy between magnetic circuit and electric circuit. How does magnetic circuit differ from the electric circuit ?

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

(a) State and explain Norton's theorem. Why is it called dual of Thevenin's theorem ?

(b) Using star-delta transformation, determine the current and power supplied by the battery in the circuit shown in **fig. 2**.

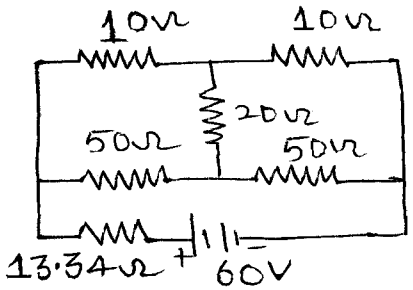

Fig. 2

(c) Determine current in all branches of the circuit shown in **fig. 3** using Superposition theorem.

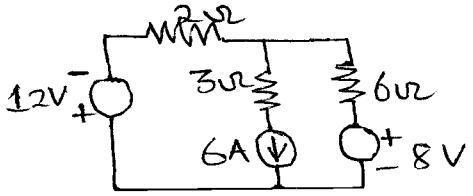

Fig. 3

(d) Calculate the value of R which will absorb maximum power from the circuit shown in **fig. 4**. Also calculate the maximum power absorbed in R.

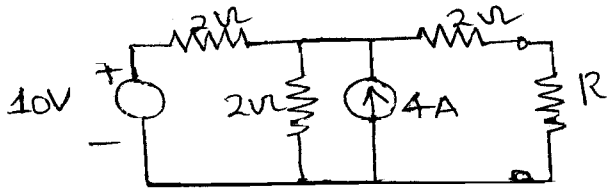

Fig. 4

(e) Why does induction type energy meter read energy while induction type wattmeter read power ?

An energy meter is designed to make 100 revolutions of the disc for one unit of energy. Calculate the number of revolutions made by it when connected to a load taking 50 A at 250 V and 0.8 power factor for an hour.

If it actually makes 980 revolutions, find the percentage error.

(f) Explain construction and principle of operation of attraction type moving iron instrument. Why is its scale not uniform ?

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

(a) Discuss advantages of three phase systems.

Three identical impedances having a resistance and a capacitance are connected in a delta across a 3-phasor, 400 V, 50 Hz supply. The power input to the load is measured by two wattmeter method. The readings of the two wattmeters are 6000 W and 2400 W. Determine

(i) the power factor of the circuit

(ii) the line current

(iii) the resistance and capacitance of each phase.

(b) Explain principle of operation of a transformer. Derive e.m.f. equation of a single phase transformer.

(c) Open and short circuit tests on a 4 kVA, 200 V/400 V single phase transformer gave the following results :

O.C. test (on L.V. side) : 200 V, 2 A, 100 W

S.C. test (on H.V. side) : 400 V, 10 A, 200 W

Determine the efficiency and voltage regulation of the transformer at full load and 0.8 power factor lagging.

4 Answer any **two** parts out of the following : **10×2=20**

(a) Explain principle of electromechanical conversion. Draw power flow diagrams for motor and generator.

(b) What are various methods of speed control of d.c. separately excited motor ? Explain in brief.

(c) A d.c. shunt motor draws 82 A at 220 V on full load. The armature and field resistances are 0.2 ohm and 110 ohm respectively. The stray losses are 600 W. Determine

(i) Constant losses and full load copper losses

(ii) Output power and overall efficiency

(iii) The maximum efficiency.

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

(a) Explain principle of operation of a three phase induction motor. What is meant by 'slip' ? Derive an expression for frequency of rotor currents.

(b) Draw and explain slip-torque characteristics of a three phase induction motor and show the effects of

(i) Varying rotor resistance

(ii) Supply voltage. State the operating conditions when the slip is

(iii) Negative

(iv) Positive, greater than one.

(c) Explain following methods of starting of a single phase induction motor

(i) Capacitor start capacitor run method

(ii) Permanent-split capacitor method.
