Roll No. 1 6 3 5 5

B.Tech. (Main & COP)
Second Semester Theory Examination 2016-17
Electrical Engineering

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

Note Attempt all questions. Assume missing data suitably.

1. **Attempt any Two parts of the following:** **(10x2=20)**

(a) Solve the circuit shown in Fig. 1. For all node voltage and all element currents. Use nodal analysis. Verity the results obtained for the element currents by mesh analysis.

(b) Derive an expression of star-to-delta transformation and vice versa.

(c) State and explain superposition theorem. Using superposition theorem, determine currents in all resistor of the network shown in Fig.2.

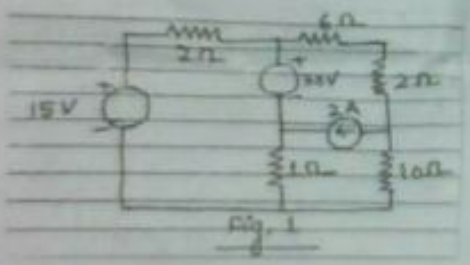

Fig. 1

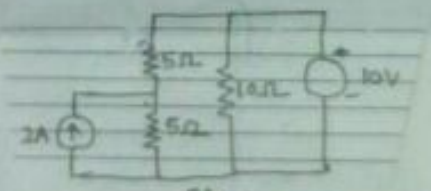

Fig. 2

2. **Attempt any two parts of the following:** **(10x2=20)**

(a) Define and explain the following:

(i) Instantaneous value (ii) Average value (iii) RMS Value (iv) Form factor (v) Peak Factor

(b) The circuit shown in Fig. 3 is connected to a 50 Hz supply. The total current 12 A leading the supply voltage by a phase angle of 30^0. The current in the top branch is 8 A. Calculate:

(i) The supply voltage
(ii) Unknown branch current
(iii) The value of R and C
(iv) The Resistance and reactance of the equivalent series circuit.

(c) What are the features of resonance in parallel circuits? Calculate the value of C which results in resonance for the circuit shown in Fig. 4 when frequency is 1000 Hz and find Q-factor for each branch.

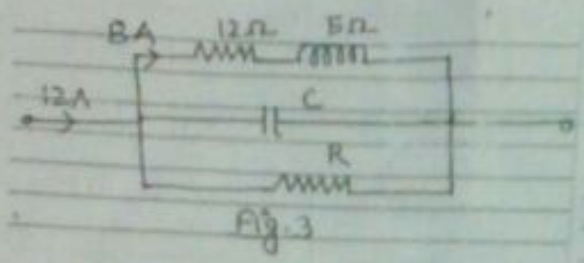

Fig. 3

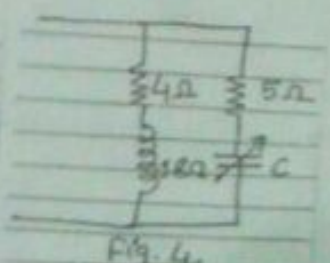

Fig. 4

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

(a) A 3-Φ delta connected load, each phase of which has an inductive reactance of 40 Ω and resistance of 25 Ω, is fed from the secondary of a 3-phase star-connected transformer, which has phase voltage of 240 V. Draw the circuit diagram of the system and calculate:

(i) The current in each phase of the load
(ii) The voltage across each phase of load
(iii) The current in the transformer secondary winding
(iv) The total supply taken from the supply and its power factor.

(b) Explain two-wattmeter method to determination of power and power factor of three-phase load with suitable diagram.

(c) Explain the construction and working principle of a moving iron attraction type instrument. Why is its scale non-uniform?

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

(a) What are similarities and dissimilarities between electric and magnetic circuits?

A magnetic core, in the form of a closed ring, has a mean length of 20 cm a cross section of 1 cm^2. The relative permeability of iron is 2400. What direct current will be needed in a coil of 2000 turns uniformly wound round the ring to create a flux of 0.2 mWb in the iron? If an air gap of 1 mm is cut through the core

perpendicular to the direction of flux, what fraction of total ampere-turns is required to maintain the same flux in the air-gap.

(b) A 1-Φ, 250/500 transformer gave the following results.
Open circuit test: - 250 V, 1 A, 80 W on L.V. side
Short circuit test: - 20 V, 12 A, 100 W on H.V. side.
Calculate the circuit constants and shown them on an equivalent circuit.

(c) Explain the working of 1-Φ auto transformer. Show that there will be saving of copper in auto-transformer in comparison to same rating of two-winding transformer.

5. **Attempt any two parts of the following:** **(10x2=20)**

(a) Derive an equation for generated torque in dc motor. A belt driven 10 kW shunt generator running at 300 rpm on 220 V brush-bars continues to run as a motor when the belt breaks then taking 10 kW. What will be its speed? Given armature resistance 0.025 Ω, field resistance 60 Ω and contact drop under each brush 1 V. Ignore armature reaction.

(b) A 3-Φ, 50 Hz induction motor has 6 poles and operated with a slip of 5% at a certain load. Determine:
(i) The speed of rotor with respect to stator.
(ii) The frequency of rotor current
(iii) The speed of rotor magnetic field with respect to rotor
(iv) The speed of rotor magnetic field with respect to stator.

(c) Why 1-Φ induction motor is not self-starting? What are methods of starting? Explain any one of them.