Faculty of Engineering & Technology
First Semester B.E. (C.B.S.) Examination
BASIC ELECTRICAL ENGINEERING
Paper—IV

Time—Two Hours] [Maximum Marks—40

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answers wherever necessary with the help of neat sketches.
(4) Use of non-programmable calculator is permitted.

1. (a) What do you understand by 'an ideal voltage source' and an 'ideal current source' ? Draw the circuit symbol and characteristics. 4

(b) Determine the circuit current drawn from 5 V battery by 'STAR-DELTA' transformation as shown in 'Fig. 1(b)'. 6

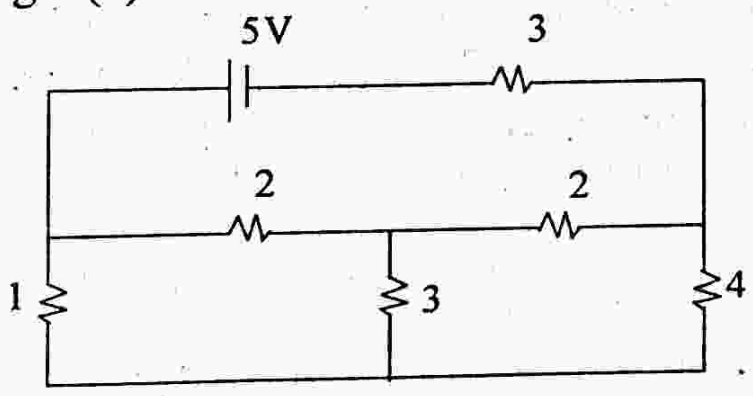

Fig. 1(b)

OR

2. (a) Determine the current 'I_x' through 10 Ω resistor as shown in 'Fig. 2(a)' using SUPERPOSITION THEOREM.

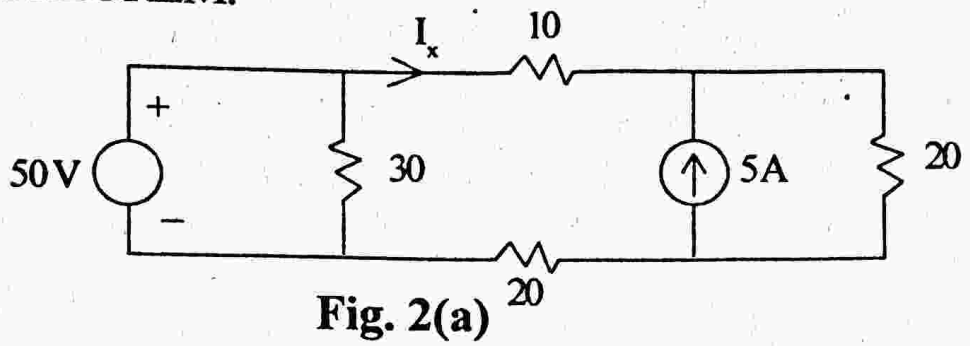

Fig. 2(a)

6

(b) A resistance of 'R Ω' is connected in series with a parallel combination of 8 Ω, 12 Ω and 24 Ω. The total power dissipated on the circuit is 80 W, when the applied voltage is 20 V. Calculate R. 4

3. (a) Define the terms :

(i) Permeability

(ii) Relative permeability

(iii) Reluctance

(iv) Permeance. 4

(b) An iron ring with a mean length of magnetic path of 20 cm and of small cross-sectional area has an air gap of 1 mm long. A current of 1 A in a coil of 440 turns wound uniformly over the ring produces a flux density of $16\pi \times 10^{-3}$ T. Neglecting leakage and fringing, determine relative permeability of iron. Assume $\pi = 3.14$. 6

OR

4. (a) Explain in what respect a magnetic circuit differs from an electric circuit. 3

(b) A cast steel of mean diameter 30 cm having a cross-sectional area of 5 cm^2 is uniformly wound with 500 turns. Determine the magnetising current required to establish a flux of 5×10^{-4} Wb :

(i) with no air gap

(ii) with a radial air gap of 1 mm.

The magnetisation curve of cast steel is given below :

B(Wb/m^2)	0.4	0.6	0.8	1	1.2
H(AT/m)	300	400	600	900	1250

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5. (a) In a series RLC circuit the current is seen to be lagging the voltage. What does it mean ? Draw the phasor diagram. Also write the equations of voltage and current in alternating form. 4

(b) A coil has a resistance of 10 Ω and and draws a current of 5A when connected across a 100 V, 60Hz supply source. Determine :

(i) inductance of the coil

(ii) power factor of the circuit and nature

(iii) equation of current in alternating form

(iv) the active and reactive power. 6

OR

6. (a) Derive the relationship between line current and phase current for 3 phase Delta connected system with phasor diagram. 5

(b) A balanced 3-phase, STAR-connected, 210 kW load takes a leading current of 160 A when connected across a balanced 3-phase, 1.1 kV, 50 Hz supply. Find the load circuit parameters per phase. 5

7. (a) The primary and secondary windings of 500-kVA, 11-kV/415-V, single-phase transformer have resistances of 0.42 Ω and 0.019 Ω, respectively. Its core losses are 2.9 kW. Calculate :

(i) copper loss at full load

(ii) efficiency of transformer at full load, 0.8 p.f. lag

(iii) efficiency of transformer at 70% of full load, upf.

(iv) the load at which the maximum efficiency occurs. 8

(b) Explain various features of an 'Ideal' transformer. 2

OR

8. (a) Justify :

In transformer, O.C. test gives Iron losses and S.C. test gives Cu-losses. 2

(b) Derive the condition for maximum efficiency of transformer. 4

(c) A transformer on no load takes 1.5 A at a power factor of 0.2 lagging when its primary is connected to a 50-Hz, 230-V supply. The transformation ratio is 1/3. Determine the primary current when the secondary is supplied a current of 40A at a p.f. of 0.8 lagging. Also find the power factor and its nature. 4