Faculty of Engineering & Technology

First Semester B.E. (C.B.S.) Examination

BASIC ELECTRICAL ENGINEERING

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.

(3) Use of non-programmable calculator is permitted.

1. (a) Using Source Transformation, convert the circuit given below to a single voltage source in series with a resistor. Refer Fig. 1(a). 4

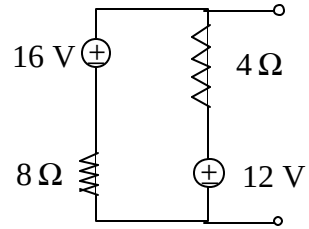

Fig. 1(a)

(b) Using Superposition principle, find current (I) through 3Ω resistor. Refer Fig. 1(b). 6

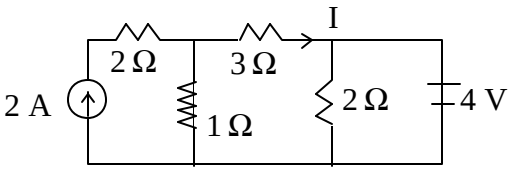

Fig. 1(b)

OR

2. (a) Find the value of Resistance 'R' shown in Fig. 2(a) when power consumed by the 12 Ω resistor in the given circuit is 36 watts. 4

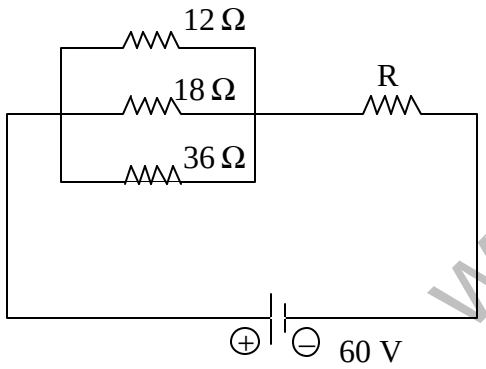

Fig. 2(a)

(b) For the circuit in Fig. 2(b), using STAR-DELTA transformation, find source current (I_S). 6

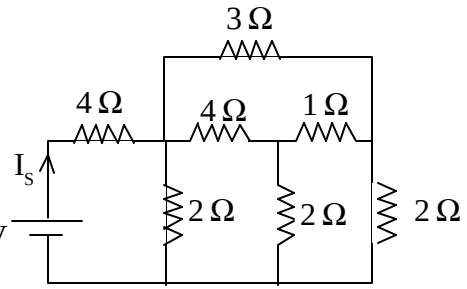

Fig. 2(b)

3. (a) Define and explain with neat sketch :

(i) Fringing

(ii) Useful flux

(iii) Leakage flux. 3

(b) An iron ring of mean length of 600 mm and having a cross-sectional area of 4 cm^2 is required to produce a flux of 0.44 m.wb. Find the mmf to be provided by the coil wound on the ring.

If a saw cut of 1 mm wide is made in the

ring, how much extra mmf is required to maintain the same flux ? The points on B-μ_r curve are :

B(wb/m²)	μ_r
0.8	2300
0.9	2150
1.0	2000
1.1	1815
1.2	1630
1.3	1365
1.4	1100

7

OR

4. (a) Draw complete hysteresis loop and explain :

(i) Remanent flux density

(ii) Residual flux

(iii) Retentivity and

(iv) Coercive force. 5

(b) A circular iron ring of mean circumference of 25 cm and cross-sectional area of 5 cm² has a radial saw cut of 1 mm in it. The ring is uniformly wound with a coil of 500 turns and current of 2 A in the coil produces a flux of 0.5×10^{-3} wb in the ring. Calculate the relative permeability of iron at this flux density. 5

5. (a) Determine the RMS value of sine wave rectifier output. 3

(b) A voltage of 200 $\angle 25^\circ$ volt is applied to a circuit composed of 2 parallel branches, if the branch currents are $10\angle 45^\circ$ A and $20\angle -30^\circ$ A, determine the KVA, KVAR and kW in each branch. Also calculate the P.F. of the combined load. 7

OR

6. (a) Derive the relationship between 'Power in Delta (P_D) and Power in Star (P_S)'. 4

(b) A balanced star connected load is supplied from a symmetrical 3ϕ, 410 V system. The current in each phase is 30 Amps and lags 30° behind the phase voltage. Find :

(i) R_P

(ii) X_p

(iii) Z_p

(iv) kW

(v) KVAR and

(vi) KVA. 6

7. (a) What are the losses in the transformer ? Explain why the rating of transformer is in KVA. 4

(b) A 100 KVA, 1 KV/10KV, 50 Hz, 1-phase transformer has iron losses of 1100 watts and the copper loss with 5 A in high voltage winding is 400 watts. Calculate the efficiency at 25% of full load at (i) UPF and (ii) 0.8 pF lag, the output being maintained at 10,000 V. 6

OR

8. (a) A 15 KVA, 2200/110 V transformer has $R_1 = 1.75\ \Omega, R_2 = 0.0045\ \Omega$. The leakage reactances are $X_1 = 2.6\ \Omega$ and $X_2 = 0.0075\ \Omega$. Calculate :

(i) Equivalent resistance referred to primary and secondary.

(ii) Equivalent reactance referred to primary and secondary.

(iii) Total copper losses. 6

(b) Explain 'SHORT CIRCUIT TEST' on a single phase transformer with the help of neat sketch. 4