BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER : II**
BRANCH: CSE/AIML/ECE/EEE **SESSION : SP/2023**

SUBJECT: EE101 BASICS OF ELECTRICAL ENGINEERING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	The dependent current source I_d is related to the voltage V_{ab} in Fig. 1 through the relation $I_d = 0.4\ V_{ab}$. Evaluate the current through the 8 Ohm resistor by nodal analysis.	[5]	CO1	3

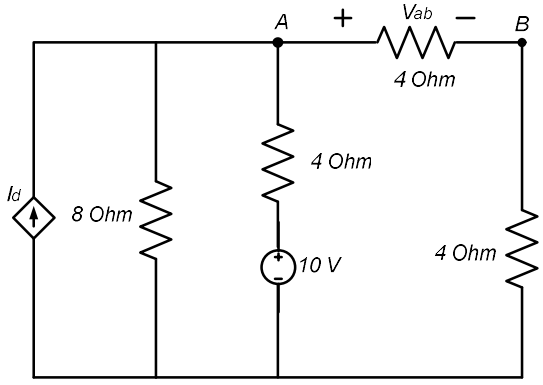

Fig. 1

Q.1(b)	A steel ring 25 cm diameter and of circular section with thickness of 3cm in diameter has an air gap of 1.5 mm. If it is wound uniformly with 750 turns of conductor carrying current of 2.1 A, then Evaluate : (i) mmf, (ii) magnetic flux, (iii) magnetic flux density in air gap,(iv) relative permeability of steel ring . Assume that the steel section takes 35% of the total mmf.	[5]	CO1	5
Q.2(a)	Two elements based series circuit consumes 700 W and has power factor of 0.707 (leading). If the applied voltage is $v = 141\sin(314t + 30^\circ)$, obtain the circuit constants.	[5]	CO2	2
Q.2(b)	(i) An alternating voltage is given by equation $v = 282.84\sin(377t + \frac{\pi}{6})$ Obtain (a) rms value, (b) frequency, (c) time period. (ii) A series resonant circuit has an impedance of 500 Ohm at resonant frequency and cut-off frequencies are 10 kHz and 100 kHz respectively. Evaluate (a) the resonance frequency, (b) values of R, L and C, (c) quality factor at resonant frequency.	[2] + [3]	CO2	2 & 5
Q.3(a)	Three impedances each of resistance 10 Ohms and series inductive reactance of 5 Ohms are connected in (i) Star (ii) Delta across a three phase 400 V supply. Obtain the line current in each case and the total power.	**[5]**	CO3	**2**
Q.3(b)	A delta-connected load is arranged as in Fig. 2. The supply voltage is 400 V at 50 Hz. Appraise: (a) the phase currents, (b) the line currents, (c) phasor diagram for line and phase currents.	**[5]**	CO3	**5**

PTO

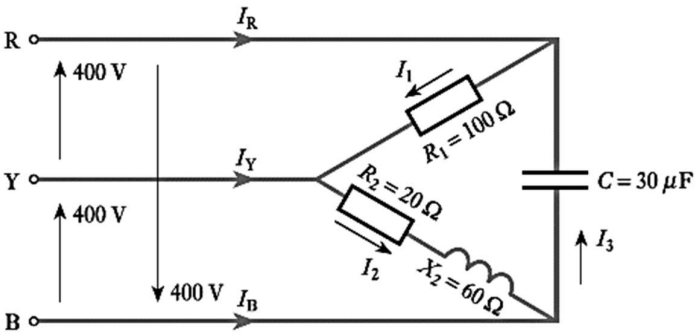

Fig. 2

Q.4(a) Use Thevenin's theorem to determine the current through the variable load resistor as in Fig. 3 when (i) R_L = 1 Ohm, (ii) R_L = 3 Ohms [5] CO4 3

Fig. 3

Q.4(b) Two similar coils have a coupling co-efficient of 0.2. When they are connected in series, cumulatively, the total inductance is 120 mH. Calculate [5] CO1 3

a) The self-inductance of each coil.
b) The total inductance when the coils are connected in series differentially.
c) The total magnetic energy due to current of 3A when the coils are connected in series: (i) cumulatively, (ii) differentially.

Q.5(a) Enlist at-least two major equipments for power transfer? Explain the construction and working principle of single phase transformer. [5] CO5 2

Q.5(b) Each phase of a 3-phase, Δ-connected load consists of an impedance $Z = 20\angle 60^0$ Ohms. The line voltage is 440 V at 50 Hz. Evaluate the power consumed by each of the phase impedances and the total power. Obtain the readings of the two wattmeters connected. [5] CO3 & CO5 2

:::::20/07/2023:::::