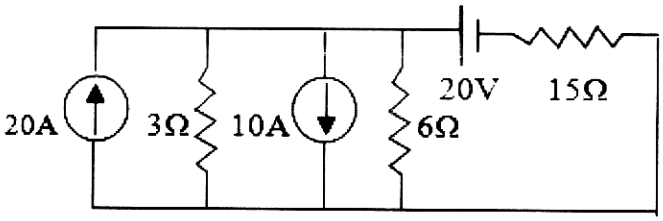
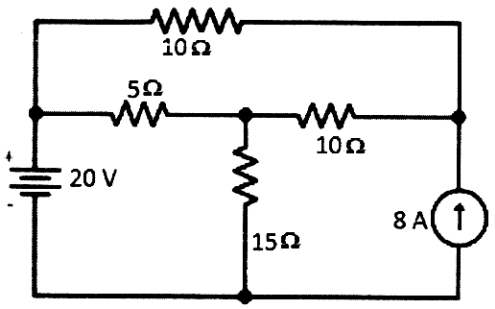
Ref. No. EX/EE/5/T/111/2019(Old)

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMMESTER EXAMINATION, 2019 (Old)

SUBJECT : PRINCIPLES OF ELECRICAL ENGINEERING

Full Marks -100

Time : Three hours

No. of question	**Answer any FIVE questions.**	Marks
1. a)	State and explain Maximum Power Transfer Theorem.	4
b)	Determine current through the 15Ω resistor in the following circuit using "Superposition Theorem". 	8
c)	Three resistors of 25 Ω resistances are connected in star. Find the equivalent delta resistances. If a dc voltage source of 220 V is connected across any two terminals of the equivalent delta connected resistances, find the current drawn from the source. For what value of load resistance, the given circuit will consume maximum power? Find the value of maximum power.	8
2. a)	How an unbalanced system of three phase vectors can be resolved into three balanced systems of vectors? Highlight the properties of each of the resolved vectors with suitable diagrams.	10
b)	Draw and label a pure sinusoidal waveform of current. Derive the relation between R.M.S. and Average value(s) with the Maximum value of a pure sinusoidal wave form of current. Also determine its 'Form Factor' and 'Peak Factor'.	10
3.a)	State and explain Thevenin's and Norton's Theorem. Determine the current through 15Ω resistor in the following circuit using "Thevenin's theorem". 	10

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b)	A 20 Ω resistance and 25 mH inductance are connected in series and the circuit is fed from a 230V, 50 Hz ac supply. Find the inductive impedance, admittance, current, active power consumption and power factor of the circuit. Draw the phasor diagram.	10
4. a)	Explain the term inductance of a coil. Find the expression of energy stored in any conductor.	8
b)	Define magnetic field strength and magnetic flux density. Find the relationship between them.	4
c)	Explain Star-Delta and Delta-Star transformation in any electrical circuit.	8
5.a)	What do you mean by hysteresis loss and eddy current loss?	4
b)	Determine magnetic field strength and flux density (i) around a long straight conductor, (ii) within a solenoid using Ampere's Law.	8
c)	Define Coulomb's Law for force between two point charges and hence give the definition of unit of charge. Define electric field intensity and potential.	8
6.a)	The magnetic field due to a current carrying circular loop of radius 15 cm at its centre is 0.58×10^{-4}T. Find the magnetic field due to this loop at a point on the axis at a distance of 5 cm from the centre.	10
b)	Determine capacitance per unit length between two coaxial cylinders with the assumption that +q charge is on the outer surface of the inner cylinder and the outer cylinder is earthed.	10
7.a)	Define magnetic hysteresis and explain hysteresis loop. Explain the terms 'retentivity' and 'coercive force' in this context.	8
b)	An iron ring of mean circumference 85 cm is made from round iron of area 8 cm^2. It has a saw cut of 2 mm wide and is wound with 700 turns. Find the current required to produce a flux of 1 mWb across the air gap and 1.25 through iron path. Assume a relative permeability for iron as 625.	8
c)	State and explain Ampere's Law with example.	4
8.a)	State Gauss's Law.	2

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Full Marks -100

Time : Three hours

b)	Define (i) magnetomotive force, (ii) magnetic flux and (iii) reluctance, related to a magnetic circuit. Compare electric and magnetic circuit.	10
c)	The hysteresis loop of a sample of sheet steel subjected to a maximum flux density of 1.3 Wb/m^2 has an area of 95 cm2, the scale being 1cm=0.1 Wb/m^2 and 1 cm=50 AT/m. Frequency is 50 Hz. Calculate the hysteresis loss when 1500 cm^3 of the same material is subjected to an alternating flux of 1.5 Wb/m^2.	8