

**B.E. CHEMICAL ENGINEERING FIRST YEAR SECOND SEMESTER EXAMINATION (Old), 2018**  
**( 1<sup>st</sup> Year 2<sup>nd</sup> Semester)**

**SUBJECT : ELECTRICAL TECHNOLOGY**

**Full Marks -100**

**Time : Three hours**

No. of question	Answer any five questions.	Marks
1. a)	State and explain Norton's theorem.	4
b)	Determine current through the $15\Omega$ resistor in the following circuit using "Superposition Theorem". <div data-bbox="358 688 1015 898" style="text-align: center;"> </div>	6
c)	Three resistors of $20\Omega$ resistances are connected in star. Find the equivalent delta resistances. If a dc voltage source of $230\text{ V}$ 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.	10
2. a)	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'.	8
b)	A $30\Omega$ resistance and $30\text{ mH}$ inductance are connected in series and the circuit is fed from a $230\text{V}$ , $50\text{ Hz}$ ac supply. Find the inductive impedance, admittance, current, active power consumption and power factor of the circuit.	6
c)	"For a given network, the Thevenin's equivalent resistance and Norton's equivalent resistance are numerically equal."--- Correct and/or Justify the statement.	2
d)	Mention similarities and dissimilarities of electric and magnetic circuits.	4
3.a)	An air cored toroidal coil has $200$ turns. The length of the magnetic circuit is $25\text{ cm}$ and the cross-sectional area is $5\text{ cm}^2$ . Determine the current required to establish a flux of $1\text{ wb}$ .	6

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b)	Explain the reason for Hysteresis and Eddy current loss. What are the methods to minimize these losses?	6
c)	Write down the method of measurement of power consumption and power factor of any three phase electric circuit by two wattmeter method. Assume balanced load and sinusoidal voltage and current waveform for the three phase circuit.	8
4. a)	Derive an expression for induced emf in a transformer winding.	5
b)	Describe the tests used to determine the circuit parameters of a transformer. Draw the equivalent circuit obtained from these tests.	10
c)	What are the different types of losses in a transformer? Discuss briefly.	5
5.a)	Explain commutation process for a dc machine with proper diagram.	10
b)	Explain why starter is needed in dc motor.	5
c)	A 4-pole dc generator with 400 armature conductors has a useful flux of 0.04 Wb per pole. What is the emf produced if the machine is wave wound and runs at speed 1200 rpm?	5
6.a)	Draw the torque speed characteristic of a three phase induction motor.	5
b)	Describe the constructional features of both squirrel cage induction motor and wound rotor induction motor. Discuss the merits of one over another.	11
c)	The frequency of the emf in the stator winding of a 4-pole induction motor is 50 Hz. The motor is running at 1440 rpm. Find the value of slip and rotor frequency?	4
7.	Write short notes on ( <i>any four</i> ):	5x4
	(a) Cooling of transformer	
	(b) Conservator & Breather	
	(c) Voltage build up in DC shunt generator	
	(d) Star delta starter	
	(e) Hysteresis loop.	
	(f) Maximum Power Transfer Theorem	