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BESCK104B

## First Semester B.E./B.Tech. Degree Examination, June/July 2025 Introduction to Electrical Engineering

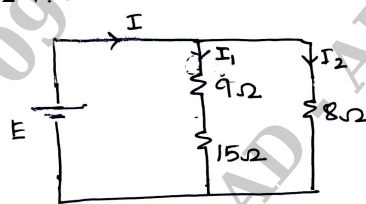
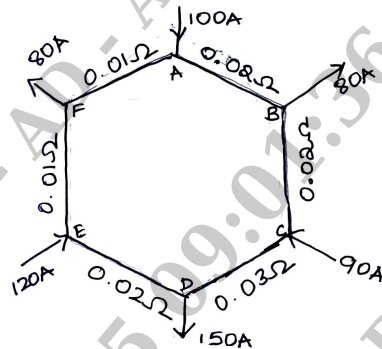
Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.*

*2. VTU Formula Hand Book is permitted.*

*3. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
<b>Q.1</b>	a.	With the help of single line diagram explain the electric power transmission and distribution system.	08	L2	CO5
	b.	State and explain KCL and KVL with example.	06	L2	CO1
	c.	Given the network shown in Fig.Q1(c). Determine the $I_1$ , $E$ , $I_2$ and $I$ , if the voltage across $9\ \Omega$ is $72\ \text{V}$ . <div style="text-align: center;">  <p>Fig.Q1(c)</p> </div>	06	L3	CO1
<b>OR</b>					
<b>Q.2</b>	a.	Find the current in the various branches of the given network in Fig.Q2(a). <div style="text-align: center;">  <p>Fig.Q2(a)</p> </div>	08	L3	CO1
	b.	Draw the block diagram and explain the working of solar power generation.	06	L2	CO5
	c.	Stat and explain the Ohm's Law with its limitation.	06	L2	CO1
Module – 2					
<b>Q.3</b>	a.	Show that current $i(t)$ lags the applied voltage by $90^\circ$ in a pure inductor. Also show that the power consumed by the inductor is zero.	08	L2	CO2
	b.	A voltage $v(t) = 100 \sin 314t$ is applied to a circuit consisting of $25\ \Omega$ and an $80\ \mu\text{F}$ capacitor in series. Determine (i) Peak value of current (ii) Power factor (iii) Total power consumed by the circuit.	06	L3	CO2
	c.	Mention the advantages and disadvantages of 3 phase over single phase.	06	L2	CO2
<b>OR</b>					
<b>Q.4</b>	a.	A balanced star connected load of $(8 + j6)\ \Omega$ per phase is connected to a $3\ \phi$ , $230\ \text{V}$ supply. Find the line current power factor, real power, reactive volt ampere and total voltampere.	06	L3	CO2
	b.	Derive the expression for power in a series R-C circuit and draw the voltage and current waveform.	06	L2	CO2

<b>Q.4</b>	<b>c.</b>	A series circuit of a resistance of 10 $\Omega$ inductor of 16 mH and a capacitor of 150 $\mu$ F are connected in series. A supply voltage of 100 V at 50 Hz is given to the circuit. Find the impedance, current, power factor and power consumed in the circuit.	<b>08</b>	<b>L3</b>	<b>CO2</b>
<b>Module – 3</b>					
<b>Q.5</b>	<b>a.</b>	With usual notation derive the torque equation of a DC motor.	<b>08</b>	<b>L2</b>	<b>CO3</b>
	<b>b.</b>	An 8 pole DC shunt generator has 78 wave connected conductor on its armature while running at 500 RPM. It supplies power to a load of 12.5 $\Omega$ at 250 V. The armature and the shunt field resistance are 0.24 $\Omega$ and 250 $\Omega$ respectively. Determine the armature current, the emf induced and the flux per pole.	<b>06</b>	<b>L3</b>	<b>CO3</b>
	<b>c.</b>	Explain why series motor should not be started on no-load.	<b>06</b>	<b>L3</b>	<b>CO3</b>
<b>OR</b>					
<b>Q.6</b>	<b>a.</b>	Derive E.M.F equation of the DC generator.	<b>06</b>	<b>L2</b>	<b>CO3</b>
	<b>b.</b>	A 230 V, dc series motor has an armature circuit resistance of 0.2 $\Omega$ and series field resistance of 0.1 $\Omega$ . At rated voltage, the motor draws a line current of 40 A and runs at a speed of 1000 rpm. Find the speed of the motor for a line current of 20 A at 230 V. Assume that the flux at 20 A line current is 60% of the flux at 40 A line current.	<b>06</b>	<b>L3</b>	<b>CO3</b>
	<b>c.</b>	With a neat sketch, explain the construction of the various part of DC generator.	<b>08</b>	<b>L2</b>	<b>CO3</b>
<b>Module – 4</b>					
<b>Q.7</b>	<b>a.</b>	Explain the rotating magnetic field in a 3 phase induction motor with neat vector diagram.	<b>08</b>	<b>L3</b>	<b>CO3</b>
	<b>b.</b>	The maximum efficiency of a full load and unity power factor of a single phase 25 KVA, 500/1000 V, 50 Hz transformer is 98%. Determine its efficiency at i) 75% load, 0.9 p.f and ii) 50% load, 0.8 p.f.	<b>07</b>	<b>L3</b>	<b>CO3</b>
	<b>c.</b>	List the difference between squirrel cage and slip ring rotor.	<b>05</b>	<b>L1</b>	<b>CO3</b>
<b>OR</b>					
<b>Q.8</b>	<b>a.</b>	Derive the emf equation of a transformer. Also explain the working principle of the transformer.	<b>08</b>	<b>L2</b>	<b>CO3</b>
	<b>b.</b>	List the various losses occurring in a transformer, explain how copper loss varies with load.	<b>06</b>	<b>L2</b>	<b>CO3</b>
	<b>c.</b>	The frequency of EMF in the stator of 4 pole induction motor is 50 Hz, and the frequency of EMF in the rotor is 1.5 Hz. What is the slip and at what speed is the motor running?	<b>06</b>	<b>L3</b>	<b>CO3</b>
<b>Module – 5</b>					
<b>Q.9</b>	<b>a.</b>	What is earthing? With a neat diagram, explain plate earthing.	<b>08</b>	<b>L2</b>	<b>CO4</b>
	<b>b.</b>	Explain the working principle of fuse and MCB.	<b>06</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	Explain 'unit' used in electrical energy consumption. Also explain two part tariff with its advantages and disadvantages.	<b>06</b>	<b>L3</b>	<b>CO5</b>
<b>OR</b>					
<b>Q.10</b>	<b>a.</b>	What is electric shock? List the preventive measures against the shock.	<b>08</b>	<b>L2</b>	<b>CO5</b>
	<b>b.</b>	With neat circuit diagram and switching table explain two-way and three-way control of lamp.	<b>06</b>	<b>L2</b>	<b>CO5</b>
	<b>c.</b>	Calculate the electricity bill amount for a month of 31 days, if the following device are used: i) 3 bulbs of 30 Watts for 5 hours ii) 4 tube lights of 50 Watts for 8 hours iii) 1 Fridge of 300 Watts for 24 hours Given the rate of electricity is 4.2 Rs per unit.	<b>06</b>	<b>L3</b>	<b>CO5</b>