Seat No.: 2644

Enrollment No.: 102CTBTCSE122038

NATIONAL FORENSIC SCIENCES UNIVERSITY

B.Tech.-M.Tech. Computer Science & Engineering (Cyber Security) – Semester 1 – Mar-2022

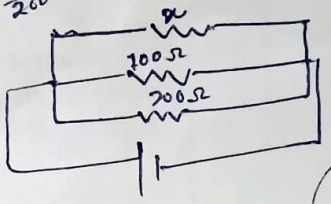
Subject Code: CTBTCSE SI P3 **Date:**

Subject Name: Basics of Electrical Engineering

Time: **Total marks: 100**

Instructions:

1. **Write down answer of each question on separate page.**
2. **Attempt all questions.**
3. **Make suitable assumptions whenever necessary.**
4. **Figures to the right indicate full marks.**



			Marks
Q.1	(a)	Resistance x in parallel with resistances 100 Ω and 200 Ω gives an equivalent resistance of 50 Ω. Find the value of x.	04
	(b)	Define magnetic flux, magnetomotive force, and magnetic field strength.	03
	(c)	Explain self-inductance and mutual inductance with equations.	03
	(d)	(i) Can two electric lines of force intersect? Explain your answer in brief. (ii) State at least four properties of electric lines of force. OR	06
	(d)	(i) Why do magnetic monopoles not exist? Explain your answer in brief. (ii) State at least four properties of magnetic lines of force.	
Q.2	(a)	What length of German silver wire is needed to make a 28 Ω resistor if the resistivity of German silver is 2.2 x 10^{-7} Ω m? The diameter of the wire is 0.050 cm.	04
	(b)	(i) State Kirchhoff's voltage law. (ii) Do all metals obey Ohm's law? Yes/No OR	02
	(b)	(i) Which type of magnetic material doesn't have any atomic dipole? (ii) What does the time constant in an RC circuit mean?	
	(c)	What is the meaning of R.M.S. value? Please explain its significance in brief.	02
	(d)	Derive the equations for instantaneous voltage and current for an AC circuit consisting only of pure inductance. Draw the voltage-current waveform and phasor diagram for the same. OR	05
	(d)	Derive the equation for instantaneous voltage and current for an AC circuit consisting only of pure capacitance. Draw the voltage-current waveform and phasor diagram for the same.	
	(e)	Find the average value of a sinusoidal AC waveform?	02
	(f)	Derive the equations for star-delta transformation.	03
	(g)	Convert this rectangular form, 5.2 + j3 to its polar form.	03
Q.3	(a)	A 12 pF capacitor is connected to a 50V battery. How much electrostatic energy gets stored in the capacitor?	02

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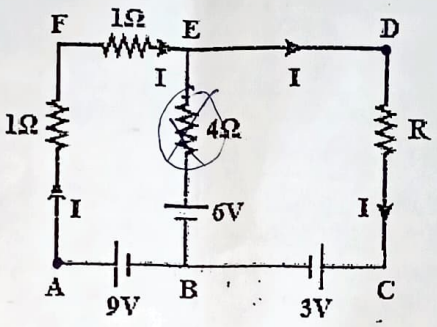
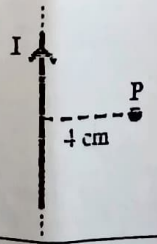
Q.3	(b)	What are the advantages of connecting electrical devices in parallel with the supply instead of connecting them in series?	02
	(c)	Differentiate E.M.F. and potential difference.	03
	(d)	Define the dielectric constant of a medium. What is its SI unit?	02
	(e)	Differentiate magnetic circuit & electric circuit.	04
	(f)	Write down the equation for (i) Average value of a symmetric full wave, (ii) Form factor, and (iii) Peak factor. OR (f) Derive the equation for the RMS value of current having instantaneous value of $I_m \sin\theta$.	03
	(g)	Find the value of unknown resistance R in the circuit below using Kirchhoff's principles, ensuring that no current flows through the 4 ohms resistance. Find the potential difference between points A and D as well. 	04
Q.4	(a)	The inductive time constant is defined as the time required for the current either to increase to 63 % of its maximum value or to decrease by 37 % of its maximum value.	02
	(b)	State advantages of a three-phase power system over a single-phase power system.	03
	(c)	Find the heat energy produced in a resistance of 10 Ω when 5 A current flows through it for 5 minutes.	03
	(d)	What is susceptance? Write down its unit.	02
	(e)	Give the difference between permeability and permittivity.	02
	(f)	What is the reciprocal of reluctance? Give SI units of reluctance.	02
	(g)	Three similar coils, each having a resistance of 5 Ω and an inductance of 0.02H are connected in delta to a 440V, 3-phase, 50Hz supply. Calculate the power factor, phase current, line current and total power absorbed.	04
	(h)	What is resistor? Explain the types of resistors in detail with figures.	07
Q.5	(a)	Draw the power triangle for an inductive AC circuit. Define true power, reactive power and apparent power with equations.	04
	(b)	A long straight wire is carrying a current of 2A. Determine the magnitude and direction of magnetic field at point P (Given, $\mu_0 = 4\pi \times 10^{-7}$ Wb $A^{-1}m^{-1}$) 	03

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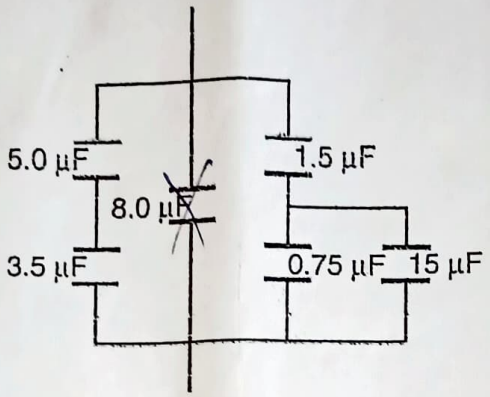
		OR	
Q.5	(b)	A three-phase, delta connected alternator drives a balanced three-phase load whose each phase current is 10 A in magnitude. At the time when $I_a = 10\angle 30°$ A. Find the polar expression for three line currents when the phase sequence is abc.	
	(c)	Find the total capacitance of the combination of capacitors shown in the figure. 	04
	(d)	Derive the equations for charging & discharging of inductor.	07
		OR	
	(d)	Derive the equations for charging & discharging of capacitor.	