Enrollment No......................................

Faculty of Engineering / Science
End Sem (Odd) Examination Dec-2022
EN3ES17 / BC3ES01 Basic Electrical Engineering

Programme: B.Tech./   Branch/Specialisation: All/ Computer
B.Sc.(CS)   Science

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   When the resistances are connected in parallel circuit then-   **1**
             (a) Branch currents are additive   (b) Conductance's are additive
             (c) Powers are additive   (d) All of these

     ii.   Polarity of the voltage drop across resistance is determined by-   **1**
             (a) Value of resister   (b) Value of current
             (c) Direction of current   (d) All of these

     iii.   An AC current is given by $i = 200 \sin 100\pi t$. it will achieve a value of   **1**
             100 A after _____ seconds.
             (a) 1/900   (b) 1/800   (c) 1/700   (d) 1/600

     iv.   At series resonance condition power factor and impedance of circuit   **1**
             will be-
             (a) 1 & Minimum   (b) Zero & Maximum
             (c) 0.8 & Zero   (d) None of these

     v.   In a four-pole D.C. machine-   **1**
             (a) All the four poles are north poles
             (b) Alternate poles are north and south
             (c) All the four poles are south poles
             (d) Two north poles follow two south poles

     vi.   A 3-phase 440 V, 50 Hz induction motor has 4% slip. The frequency of   **1**
             rotor e.m.f. will be-
             (a) 200 Hz   (b) 50 Hz   (c) 2 Hz   (d) 0.2 Hz

     vii.   In linear power supply a capacitor is used to-   **1**
             (a) Smooth the pulsating current from rectifier
             (b) Reduce the ripple factor of output
             (c) Both (a) and (b)
             (d) Reduce the output voltage

viii. The value of fusing factor is-　　　　　　　　　　　　　　　　　**1**
    (a) Less than 1　　　　　　　　(b) More than 1
    (c) Always 1　　　　　　　　　(d) None of these

ix. Three phase electrical power is generated in _____ voltage.　　**1**
    (a) 33 kV　　　　(b) 11 kV　　(c) 66 kV　　(d) 132 kV

x. _____ is used for heating non-conducting materials.　　　　　**1**
    (a) Eddy current heating　　　　(b) Arc heating
    (c) Induction heating　　　　　(d) Dielectric heating

Q.2 i. Define the following terms with an example:　　　　　　　　**4**
    (a) Linear element　　　　　　(b) Bilateral element
    (c) Active element　　　　　　(d) Passive element

  ii. Find Voltage across 1 ohm using nodal analysis.　　　　　　**6**
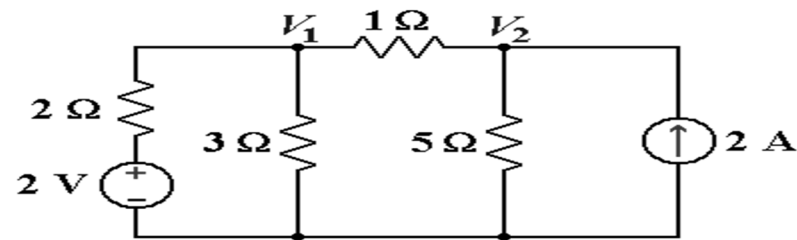
OR iii. State and explain Norton theorem with an example.　　　　　**6**

Q.3 i. Derive the expression of impedance, power factor and phase angle of　**4**
coil in RL series circuit with circuit and phasor diagram.

  ii. A choke coil is connected across a variable frequency AC supply, the　**6**
voltage of which is kept constant at 220 V. When the frequency of the
supply is 50 Hz, an ammeter in the circuit reads 60 A. On increasing
the frequency to 100 Hz, the current indicated by the same ammeter
falls to 40 A, calculate the resistance and inductance of the coil.

OR iii. Derive the relation between line and phase quantity in star connection　**6**
of three phase ac system with circuit and phasor diagram.

Q.4 i. Define the transformer and also derive emf equation of single-phase　**4**
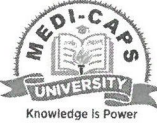transformer.

  ii. Explain the constructional details of DC machine.　　　　　**6**

OR iii. Write the working principle and phenomena of rotating of-　　　**6**
    (a) Single phase induction motor　　(b) Three phase induction motor

Q.5 i. Calculate the bill of electricity consumed in the month of November　**4**
from the following details. One 60 W bulb is used for 5 hours daily.
One 100 W bulb is used for 3 hours daily. One 1kW electric heater is
used for 2 hours daily. Tariff is 7.5 Rs. /Unit.

  ii. What is switch mode power supply (SMPS)? Explain its functioning　**6**
with block diagram.

OR iii. What is UPS? Explain functioning of online and offline UPS with　**6**
block diagram.

Q.6 Attempt any two:

  i. Represent each component of power system in single line diagram from　**5**
generation to distribution.

  ii. Explain thermal power plants with appropriate diagram.　　　**5**

  iii. Explain construction and working of welding transformer with　**5**
advantage and disadvantage.

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Scheme of Marking

Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	(d) All of the above	1
	ii)	(c) direction of current	1
	iii)	An AC current is given by i = 200 Sin100Πt. it will achieve a value of 100 A after .... second. (d) 1/600	1
	iv)	(a) 1 & Minimum	1
	v)	(b) alternate poles are north and south	1
	vi)	A 3-phase 440 V, 50 Hz induction motor has 4% slip. The frequency of rotor e.m.f. will be (c) 2 Hz	1
	vii)	In linear power supply a capacitor is used to (c) both (a) and (b)	1
	viii)	The value of Fusing factor is (b) more than 1	1
	ix)	(b) 11 kV	1
	x)	.... Is used for heating non-conducting materials (d) Dielectric heating	1
Q.2	i.	Define the term with example. (a) Linear element (b) Bilateral element (c) Active element (d) Passive element	1*4=4
	ii.	Equation at V_1 $\quad V_1 = \frac{8}{3}V, \quad V_2 = \frac{35}{9}V$ Equation at V2 Voltage at 1 ohm $\quad V_{1\Omega} = \frac{11}{9}V$	2 2 1
OR	iii.	Statement of Norton theorem Determination of I_n Determination of R_n	2 2

		Determination of I_L	1 1
Q.3	i.	Circuit diagram Phasor diagram Expression of Z, pf, and phase angle	1 1 2
	ii.	Expression of first condition $\quad 121/9 = R^2 + x^2$ Expression of second condition $\quad 121/4 = R^2 + 4x^2$ Calculation of R and L $\quad R = 2.8\,\Omega \quad L = 7.538mH$	2 2 2
OR	iii.	Circuit diagram with proper naming. Phasor diagram Derivation and result	2 2 2
Q.4	i.	Define the transformer drive emf equation	2 2
	ii.	Each part details	1*6=6
OR	iii.	Write the working principle and phenomena of rotating of (a) single phase induction motor (b) three phase induction motor	3*2=6
Q.5	i.	Each step 1 mark $\quad$ ① 9KWhr	1*4=4
	ii.	Definition of SMPS $\quad$ ② 9KWhr Explanation of each block 1 marks $\quad$ ③ 60KWhr	2 1*4=4
OR	iii.	Definition of UPS $\quad$ ④ TOTAL = 78 X 7.5 Explanation of each mode 2 marks $\quad$ = 585 RS.	2 2*2=4
Q.6			
	i.	single line diagram Component representation with symbols	3 2
	ii.	Block diagram Explanation	2 3 3
	iii.	~~Circuit diagram~~ Construction Explanation (working) advantage and disadvantage. 1 Mark for each	1 2 2 2

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