Gayatri Vidya Parishad College of Engineering for Women
(Autonomous)
(Affiliated to Andhra University, Visakhapatnam)
Madhurawada, Visakhapatnam

B.Tech. - I Semester Regular Examinations, December / January – 2025

Network Theory and Machines –(24EE11RC02)

Scheme of Valuation

Q No	Question
1(a)	Source transformation technique explanation ------ *(2M)* Source transformation technique explanation using an example ------ *(1M)* Explanation of Star to Delta transformation (formulas only) ---------*(2M)* Explanation of Star to Delta transformation using an example ---------*(2M)*
1 (b)	Obtaining equations by using suitable method (like mesh/nodal analysis/reduction technique etc.) ---------*(2M)* Finding the responses: $i_1 = 3A$, $i_2 = 2A$, $i_3 = 1A$ ---------*(3M)* $v_1 = 24V$, $v_2 = 6V$, $v_3 = 6V$ ---------*(2M)*
2(a)	Explanation of nodal analysis ----------*(3M)* Steps for applying nodal analysis ---------*(4M)*
2(b)	Formation of three mesh equations Representation of current directions and voltage polarities of every element in the circuit diagram ---------*(1M)* $18I_1 + 5I_2 + 3I_3 = 50$ ---------*(1M)* $5I_1 + 9I_2 - 2I_3 = 10$ ---------*(1M)* $3I_1 - 2I_2 + 5I_3 = 5$ ---------*(1M)* Solving the above equations to find I_1, I_2, I_3 $I_1 = 3.29A$ ---------*(1M)* $I_2 = -1.03A$ ---------*(1M)* $I_3 = -1.39A$ ---------*(1M)*
3(a)	Statement of Reciprocity theorem --------*(3M)* Verification of Reciprocity theorem using suitable example --------*(4M)*
3(b)	Equations of two port network representing transmission parameters ---------*(1M)* Relevant circuit diagrams/method used for solving A,B,C & D parameters ----*(2M)* Finding parameters A= 2.5, B= 4Ω, C= 1S & D= 2 --------*(4M)*
4(a)	Finding Thevenin resistance $R_{th} = 9\Omega$ (with suitable circuit diagram) --------*(2M)* Finding Thevenin voltage $V_{th} = 22V$ (with suitable circuit diagram) --------*(3M)* Maximum power transfer $P_{max} = V_{th}^2/(4\ R_{th}) = 13.44W$ --------*(2M)*
4(b)	Finding Thevenin resistance $R_{th} = 4\Omega$ (with suitable circuit diagram) --------*(1M)* Finding Thevenin voltage $V_{th} = 30V$ (with suitable circuit diagram) --------*(2M)* Thevenin equivalent circuit ----------*(2M)* Current through $R_L = 6\Omega$ is 3A ----------*(1M)* Current through $R_L = 36\Omega$ is 3/4A or 0.75A ----------*(1M)*
5(a)	Power factor definition -------*(2M)* Importance of Power factor --------*(2M)* Derivation of power factor expression for RL/RC/RLC circuit ----------*(3M)*
5(b)	Circuit diagram ---------*(1M)* Admittance calculation Y = 0.015-j 0.023 ℧ or $0.028\angle -56.31$ ℧ -------*(3M)* Current (I) = 1.54-j2.31 A or $2.77\angle -53.31$ A -------*(3M)*
6(a)	Circuit diagram ---------*(1M)* Resonant frequency $f_o = 50.33$ Hz (or) $\omega_o = 316.23$ rads/sec ----------*(2M)*

	Quality factor (Q) = 3.16 ***---------(2M)*** Band width (BW) = 100 rads/sec (or) 15.9 Hz ***--------(2M)***
6(b)	Circuit diagram ***---------(1M)*** Phasor diagram representing relationship between input voltage and input current ***-----(2M)*** Power factor (P.f.) = 0.55 ***-----(2M)*** Apparent power (S) = 1110VA ***-------(1M)*** Active power (P) = 610.5 W ***--------(1M)***
7(a)	Calculation of time constant (T) = 4 sec ***------(2M)*** Finding initial conditions for $i_o(0+)$ = -5A and $v_x(0^+)$= 20V ***------(2M)*** Solutions for $v_c(t) = 60\ e^{-0.25t}$ V ***------(1M)*** $v_x(t) = 20\ e^{-0.25t}$ V ***------(1M)*** $i_o(t) = -5\ e^{-0.25t}$ A ***------(1M)***
7(b)	Initial condition $v(0)$ = 15V (with circuit diagram) ***-------(2M)*** Calculation of time constant (T) = 0.2 sec ***------(2M)*** Expression for $v(t) = 15\ e^{-5t}$ V ***------(2M)*** Initial energy stored (W_o) = 2.25J ***-------(1M)***
8(a)	Circuit diagram ***---------(1M)*** Voltage across capacitor at t=0 is 0V ***--------(2M)*** Voltage across capacitor at t=∞ is 50V ***--------(2M)*** Calculation of time constant (T) = 0.05 sec ***------(2M)***
8(b)	Circuit diagram ***---------(1M)*** Finding initial conditions for i, i(0) =0A & $\frac{di(0)}{dt} = 1000\ A/s$ ***---------(2M)*** Finding roots of characteristic equation, $s_{1,2}$ = -25 ± j139.19 ***-------(1M)*** Expression for $i(t) = 7.18e^{-25t}\sin(139.19t)$ A ***--------(3M)***
9(a)	Equation of speed and different types of methods of speed control ***------(1M)*** Explanation of each method with comparison between them, Armature voltage control method ***------(2M)*** Armature resistance control method ***------(2M)*** Field flux control method ***---------(2M)***
9(b)	Operation principle of Transformer (statement only) ***----------(2M)*** Derivation of EMF expression ($E=4.44\ \phi_m f N$) ***----------(5M)***
10(a)	Constructional diagram with labelling ***----------(2M)*** Function of each part of DC machine ***------- (5M)***
10(b)	Double field revolving theory explanation with diagrams ***-------(5M)*** Significance of forward and backward rotating fields in the operation of single-phase induction motors ***-------(2M)***

By
D Srinivas Reddy
Assistant Professor
EEE Department
GVPCEW