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I/IV B.Tech (Regular) DEGREE EXAMINATION

July, 2021

First Semester

Time: Three Hours

Common to all branches

Linear Algebra and ODE

Maximum: 70 Marks

Answer Question No.1 compulsorily.

(14X1 = 14 Marks)

Answer ONE question from each unit.

(4X14=56 Marks)

(14X1=14 Marks)

1 Answer all questions.

- Define minor of a matrix.
- The maximum value of the Rank of a 4X5 matrix is.....
- If $A = \begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix}$ then find the sum and product of the eigen values of A.
- Write Cayley – Hamilton theorem.
- Write the differential equation corresponding to Newton's law of cooling.
- Find the integrating factor of $(\sqrt{1-y^2}) dx = (\sin^{-1} y - x) dy$.
- Find the particular integral of $y'' - y' + 2y = 12$.
- Write the Wronskian value of y_1, y_2 .
- Write the differential equation of L-R-C circuit with an emf $E = E_0 \sin(\omega t)$.
- Find the general solution of $(D^2 - 2)^2 y = 0$.
- Find the value of $L [3^t]$.
- State first shifting property for Laplace transforms.
- Find the value of $L^{-1} \left(\frac{1}{S^2 - 4} \right)$.
- Write Convolution theorem for Laplace transforms.

UNIT I

- Use Gauss-Jordan method to find the inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ 7M
 - For What value of 'k' the equations $x + y + z = 1$, $2x + y + 4z = k$, $4x + y + 10z = k^2$ have a solution and solve completely in each case. 7M

(OR)

- Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 7M
 - Verify Cayley – Hamilton theorem for the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find its inverse. 7M

UNIT II

- Solve $(1 + y^2) dx + (x - e^{-\tan^{-1} y}) dy = 0$. 7M
 - If the air is maintained at 30°C and the temperature of the body cools from 80°C to 60°C in 12 minutes, find the temperature of the body after 24 minutes. 7M

(OR)

- Solve $ye^{xy} dx + (xe^{xy} + 2y) dy = 0$. 7M
 - Solve $2xy' = 10x^3y^5 + y$. 7M

UNIT III

- Solve $\frac{d^2x}{dt^2} + n^2x = k \cos(nt + \alpha)$. 7M
 - Solve by the method of variation of parameters $y'' - 6y' + 9y = \frac{e^x}{x^2}$. 7M

(OR)

- Solve $y'' - 4y' + 5y = 0, y(0) = 2, y'(0) = -1$. 7M
 - Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$. 7M

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UNIT IV

8. a) Find the Laplace transform of (i) $(\sin t - \cos t)^2$ (ii) $\cos(at + b)$ 7M
b) Find the inverse Laplace transform of $\frac{1}{s^3 - a^3}$. 7M
- (OR)
9. a) Apply Convolution theorem to evaluate $L^{-1}\left[\frac{s}{(s^2 + a^2)^2}\right]$ 7M
b) Solve $y'' + 5y' + 6y = 5e^{2t}$, Given $y(0)=0$ and $y'(0)=0$ using Laplace transforms. 7M
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