18MA001

Hall Ticket Number:

Y1 9 a C S 4 2 8

I/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION

December, 2019

First Semester

Common to all branches

Linear algebra and ODE

Time: Three Hours

Maximum: 50 Marks

Answer Question No.1 compulsorily. (1X10 = 10 Marks)

Answer ONE question from each unit. (4X10=40 Marks)

1. Answer all questions (1X10=10 Marks)

(a) Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 \\ -2 & 0 & 5 \end{bmatrix}$ 1M

b) When will the system contain only unique solution in non- homogeneous equations? 1M

c) Find the Eigen values of $\begin{bmatrix} 1 & 2 & 5 \\ 0 & 3 & -4 \\ 0 & 0 & 4 \end{bmatrix}$ 1M

d) Solve $\frac{dy}{dx} = x^2 e^{-2y}$ 1M

e) What is the standard form of Bernoulli's Equation? 1M

f) Write Growth Equation. 1M

g) Solve $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 0$ 1M

h) Find PI of $(D^2 - 4)y = e^{2x}$ 1M

i) Define Laplace transform 1M

j) Find $L^{-1}\left(\frac{s^2 - 4}{s^3}\right)$ 1M

UNIT I

2. a) Find inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. 5M

b) Solve the equations $4x + 2y + z + 3w = 0,\ 6x + 3y + 4z + 7w = 0\ \ and\ \ 2x + y + w = 0$ 5M

(OR)

3. a) Find Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 5M

b) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ 5M

UNIT II

4\. a) Solve $\frac{dy}{dx} = \text{Sin}(x+y) + \text{Cos}(x+y)$ 5M

b) Solve $(x+1)\frac{dy}{dx} = y + e^{3x}(x+1)^2$ 5M

(OR)

5\. a) Solve $\left(x^4 - 2xy^2 + y^4\right)dx - \left(2x^2y - 4xy^3 + \text{Sin}\, y\right)dy = 0$ 5M

b) If the temperature of the air is 30^0C and the substance cools from 100^0C to 70^0C in 15 minutes. Then what will be the time for getting the temperature 40^0C. 5M

UNIT III

6\. a) Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = (1-e^x)^2$ 5M

b) Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ by using variation of parameters 5M

(OR)

7\. a) Solve $\left(D^2 - 2D + 1\right)\ y = x\, e^x \sin x$ 5M

b) An unchanged condenser C is charged by applying e.m.f $E\text{Sin}\left(\frac{t}{\sqrt{LC}}\right)$ through leads of self-inductance L and negligible resistance. Prove that at any time t, the charge on one of the plate is $\frac{EC}{2}\left[\text{Sin}\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}\text{Cos}\frac{t}{\sqrt{LC}}\right]$ 5M

UNIT IV

8\. a) (i). Find $L\left[t^3e^{-3t}\right]$ 2M

(ii). Find $L\left(\frac{e^t \sin t}{t}\right)$ 3M

b) Find $L^{-1}\left(\frac{2s^2-1}{(s^2+1)(s^2+4)}\right)$ 5M

(OR)

9\. a) Using Convolution theorem, find $L^{-1}\left[\frac{1}{(s+1)(s+3)}\right]$ 5 M

b) By the method of transforms, solve $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t$ given $x(0) = 2$ *and* $x'(0) = -1$ 5 M