Total No. of Questions : 4]

SEAT No. :

PC384

[Total No. of Pages : 3

[6359]-504
S.E. (Civil) (Insem)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207001)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) *Attempt Q.1 or Q.2 and Q.3 or Q.4.*
2) *Use of electronic pocket calculator is allowed.*
3) *Assume suitable data, if necessary.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Figures to the right indicate full marks.*

Q1) a) Solve the following differential equations (Any two)

i) $(D-4)^3 y = e^{4x} + 3^x$ where $D = \frac{d}{dx}$ **[5]**

ii) $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = x^6$ **[5]**

iii) $(D^2 + 3D + 2)y = \sin e^x$ [Use variation of parameter method] **[5]**

b) A light horizontal strut AB of length '*l*' is freely pinned at A & B and is under the action of equal and opposite compressive forces 'P' at each of its ends with load 'W' at its centre governed by the differential equation **[5]**

$$EI\frac{d^2y}{dx^2} = -\left[\frac{W x}{2} + P y\right]$$

for $x = 0, y = 0$, for $x = \frac{l}{2}, \frac{dy}{dx} = 0$

show that the deflection at the centre is $\frac{W}{2P}\left(\frac{1}{n}\tan\frac{nl}{2} - \frac{l}{2}\right)$

$$\left(\text{where } n^2 = \frac{P}{EI},\ E : \text{modulus of elasticity},\ I : \text{Moment of inertia}\right)$$

OR

P.T.O.

Q2) a) Solve the following differential equations (Any two)

i) $(D^2 - 6D + 9)y = \frac{e^{3x}}{x}$ **[5]**

ii) $(D^2 - 4D + 3)y = e^x . \cos 2x$ **[5]**

iii) $\frac{dx}{yz} = \frac{dy}{xz} = \frac{dz}{xy}$ **[5]**

b) Find the elastic curve of a uniform cantilever beam of length 'l' having a constant weight 'W' kg per unit length and determine the deflection at the free end. **[5]**

Q3) a) Solve following system of equations by using Gauss-elimination method **[5]**

$10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22$

b) Use the Runge - Kutta fourth order method to solve **[5]**

$\frac{dy}{dx} = x^2 + y^2$; $y(0) = 1$ at $x = 0.1$ with $h = 0.1$

c) Solve the following system of equations by using Cholesky-method **[5]**

$9x_1 + 6x_2 + 12x_3 = 17.4$

$6x_1 + 13x_2 + 11x_3 = 23.6$

$12x_1 + 11x_2 + 26x_3 = 30.8$

OR

Q4) a) Solve by Jacobi Iteration method **[5]**

$10x + y - z = 11.19$

$x + 10y + z = 28.08$

$-x + y + 10z = 35.61$

Correct to two decimal places.

b) Use Euler's modified method to find the value of satisfying the equation

$\frac{dy}{dx} = \log(x + y)$; $y(1) = 2$.

Find y for $x = 1.2$ by taking $h = 0.2$. **[5]**

c) Numerical solution of the differential equation $\frac{dy}{dx} = xy + y^2$ is tabulated as

x	0	0.1	0.2	0.3
y	1.0000	1.1169	1.2773	1.5049

Find y at $x = 0.4$ by Milne's predictor - corrector method by taking $h = 0.1$. **[5]**