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PC384

SEAT No. :

[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) [5]
- i) $(D - 4)^3 y = e^{4x} + 3^x$ where $D = \frac{d}{dx}$ [5]
- ii) $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + 4y = x^6$ [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]

$$EI \frac{d^2 y}{dx^2} = -\left[\frac{Wx}{2} + Py \right]$$

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

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

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

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) $(D^2 - 4D + 3)y = e^x \cdot \cos 2x$ [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]

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

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]

