

Total No. of Questions : 4]

SEAT No. :

PE-531

[Total No. of Pages : 3

[6578]-4

S.E. (Civil) (Insem.)

ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - III) (207001)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, 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) $(D^2 - 4D + 4)y = e^x + \sin 2x + x$ [5]

ii) $(D^2 + 1)y = \cot x$ [Use variation of parameter method] [5]

iii) $(x+1)^2 \frac{d^2 y}{dx^2} + (x+1) \frac{dy}{dx} + y = \cos[\log(1+x)]$ [5]

b) The deflection of a strut of length 'l' with one end ($x = 0$) built-in and the other supported, subjected to end thrust 'p' satisfies the differential equation. [5]

$\frac{d^2 y}{dx^2} + a^2 y = \frac{a^2}{P} R(l-x)$, prove that the deflection curve is $y = \frac{R}{P}$

$\left(\frac{\sin ax}{a} - l \cos ax + l - x \right)$ where $al = \tan al$

OR

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

i) $\frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} + 4y = e^{-2x} \sec^2 x (1 + 2 \tan x)$ [5]

ii) $\frac{d^2 y}{dx^2} + 4y = x \sin x$ [5]

iii) $\frac{dx}{3z-4y} = \frac{dy}{4x-2z} = \frac{dz}{2y-3x}$ [5]

P.T.O.

- b) A horizontal beam is uniformly loaded. It's one end fixed and other end is subjected to a tensile force 'P'. The deflection of the beam is

given by $EI \frac{d^2y}{dx^2} = Py - \frac{Wx^2}{2}$ given that $\frac{dy}{dx} = 0, y = 0$ at $x = 0$

show that the deflection of a beam for a given x is

$$y = -\frac{W}{2Pn^2} [e^{nx} + e^{-nx} - n^2x^2 - 2]$$

where $n^2 = \frac{P}{EI}$ [5]

- Q3) a) Use Gauss-elimination method with Partial Pivoting to solve following system of equations [5]

$$8y + 2z = -7$$

$$3x + 5y + 2z = 8$$

$$6x + 2y + 8z = 26$$

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

$$\frac{dy}{dx} = x + y, y(1) = 1.5 \text{ at } x = 1.1 \text{ with } h = 0.1$$

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

$$4x_1 + 6x_2 + 8x_3 = 0$$

$$6x_1 + 34x_2 + 52x_3 = -160$$

$$8x_1 + 52x_2 + 129x_3 = -452$$

OR

- Q4) a) Apply Gauss-Seidel method to solve the equations. [5]

$$27x_1 + 6x_2 - x_3 = 85$$

$$6x_1 + 15x_2 + 2x_3 = 72$$

$$x_1 + x_2 + 54x_3 = 110$$

- b) Using modified Euler's method find an approximate value of y when

$x = 0.1$ given that $\frac{dy}{dx} = x + y; y(0) = 1$, by taking $h = 0.1$ [5]

- c) Numerical Solution of the differential Equation $\frac{dy}{dx} = \frac{2-y^2}{5x}$ is tabulated as [5]

x	4	4.1	4.2	4.3
y	1.0	1.0049	1.0097	1.0143

Use Milne's predictor-Corrector method to find y at $x = 4.4$ by taking $h = 0.1$
