

Total No. of Questions : 4]

SEAT No. :

PA-422

[Total No. of Pages : 3

[5931]-4

S.E. (Civil)

ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - I) (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 any two

[10]

- i) $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x$
- ii) $\frac{d^2y}{dx^2} + y = x \sin x$ by applying the method of variation of parameters.
- iii) $(D^2 + 5D + 6)y = e^{-2x} + x^2$

b) The deflection of a strut of length l with one end ($x = 0$) built in and the other supported and subjected to end thrust P satisfies the equation

$$\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(l-x) \quad [5]$$

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 any two

[10]

- i) $\frac{dx}{x^2 - y^2 - z^2} = \frac{dy}{2xy} = \frac{dz}{2xz}$

P.T.O.

ii) $\frac{dx}{dt} = 3x + 8y, \frac{dy}{dt} = -x - 3y$ if $x(0) = 6$ and $y(0) = -2$

iii) $(D^2 + 3D + 2)y = xe^x + \cos x$

b) The differential equation for the elastic curve of a beam is

$EI \frac{d^2y}{dx^2} = -\frac{W}{2}x - Py$ where E, I, W and P are constants. Assume the beam to be positioned horizontally with one end at $x = 0$ and the other end at $x = l$. With $y(0) = 0$ and $\left(\frac{dy}{dx}\right)_{x=\frac{l}{2}} = 0$, show that the deflection at the

centre is $\frac{W}{2P} \left(\frac{1}{n} \tan \frac{nl}{2} - \frac{l}{2} \right)$ where $n^2 = \frac{P}{EI}$ [5]

Q3) a) Solve the following system by Cholesky method [5]

$$\begin{aligned} 2x - y &= 1 \\ -x + 3y + z &= 0 \\ y + 2z &= 0 \end{aligned}$$

b) Use Runge Kutta fourth order Method to solve $\frac{dy}{dx} = \sqrt{x^2 + y}$ to find y at $x = 0.4$, given $y(0) = 1$, take $h = 0.2$. [5]

c) Solve by Jacobi's Iteration method system of equations. [5]

$$\begin{aligned} 20x_1 + x_2 - 2x_3 &= 17 \\ 3x_1 + 20x_2 - x_3 &= -18 \\ 2x_1 - 3x_2 + 20x_3 &= 25 \end{aligned}$$

OR

Q4) a) Solve the following system using Gauss Seidel Method [5]

$$\begin{aligned} 20x + y - 2z &= 17 \\ 3x + 20y - z &= -18 \\ 2x - 3y + 20z &= 25 \end{aligned}$$

b) Use modified Euler's Method to solve [5]

$$\frac{dy}{dx} = \log(x+y); y(1) = 2 \text{ for } x=1.2 \text{ and } x=1.4 \text{ by taking } h=0.2.$$

c) Solve the equation $\frac{dy}{dx} = 1+y^2$ is tabulated as [5]

x	0	0.2	0.4	0.6
y	0	0.2027	0.4228	0.6841

Use Adam-Moulton method to find y at $x=0.8$ taking $h=0.2$.
