Total No. of Questions : 4]

SEAT No. :

P-5378

[Total No. of Pages : 3

[6186]-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) $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^x.\cosh x$ **[5]**

ii) $\frac{d^2y}{dx^2} + y = x^2 + 1$ **[5]**

iii) $\frac{d^2y}{dx^2} + 4y = \sec 2x$ (By Variation of parameter method) **[5]**

b) The differential equation satisfied by a beam, uniformly loaded with one end fixed and second subjected to a tensile force 'p' is given by **[5]**

$$\text{E.I. } \frac{d^2y}{dx^2} - P\,y = -\frac{w}{2}x^2 \left(\text{where } n^2 = \frac{P}{EI} \right),$$

Show that the elastic curve for the beam under conditions $y = 0,\ \frac{dy}{dx} = 0$ for $x = 0$ is given by $y = \frac{W}{2P}\left[x^2 + \frac{2}{n^2} - \frac{e^{nx}}{n^2} - \frac{e^{-nx}}{n^2} \right]$.

OR

P.T.O.

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

i) $(3x+1)^2\frac{d^2y}{dx^2}-3(3x+1)\frac{dy}{dx}+9y=x$ **[5]**

ii) $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=e^{e^x}$ **[5]**

iii) $\frac{dx}{y^2z^2}=\frac{dy}{x^2z^2}=\frac{dz}{y^2x^2}$ **[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 the following system of equations by using Gauss-elimination method **[5]**

$4x + y + z = 4$

$x + 4y - 2z = 4$

$3x + 2y - 4z = 6$

b) Using Runge-Kutta method of fourth order to solve **[5]**

$\frac{dy}{dx}=xy,\ y(1)=2,$ at $x=1.2$ with $h = 0.2$.

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

$4x_1 + 2x_2 + 14x_3 = 14$

$2x_1 + 17x_2 - 5x_3 = -101$

$14x_1 - 5x_2 + 83x_3 = 155$

OR

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

$10x_1 + x_2 + x_3 = 12$

$2x_1 + 10x_2 + x_3 = 13$

$2x_1 + 2x_2 + 10x_3 = 14$

b) Solve the equation $\frac{dy}{dx} = x^2 + y; y(0) = 1$ to find y at $x = 0.05$, using Euler's modified method by taking $h = 0.05$. **[5]**

c) Numerical Solution of the differential equation $\frac{dy}{dx} = 2 + \sqrt{xy}$ is tabulated as follows : **[5]**

x	1.0	1.2	1.4	1.6
y	1.0	1.6	2.2771	3.0342

Find y at $x = 1.8$ by Milne's predictor-corrector method by taking $h = 0.2$.