Question Paper

Exam Date & Time: 19-Nov-2018 (08:30 AM - 11:30 AM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

FIRST SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2018

Engineering Mathematics - I [MAT 1151 - 2018 -PHY/CHM]
Engineering Mathematics - I [MAT 1151 - 2018 -CHM]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) (3)

A) Reduce the matrix A= $\begin{bmatrix} 1 & 4 & 5 & -9 & -7 \\ -1 & -2 & -1 & 3 & 1 \\ -2 & -3 & 0 & 3 & -1 \\ 0 & -3 & -6 & 4 & 9 \end{bmatrix}$ to echelon form and hence find rank of A.

B) (3)

Solve $10x + 2y + z = 9$, $-2x + 3y + 10z = 22$, $x + 10y - z = -22$ by Gauss-Seidel method. Carry out four iterations upto four decimal places.

C) Solve $xy \; ln\left(\frac{x}{y}\right) dx + \left(y^2 - x^2 \; ln\left(\frac{x}{y}\right)\right) dy = 0$. (4)

2) (3)

A) Find all the eigenvalues and eigenvector corresponding to least eigenvalue of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

B) (3)

Solve $x^2y'' + 3xy' + y = \frac{1}{(1-x)^2}$.

C) (4)

Solve the simultaneous differential equations

$\frac{dx}{dt} = 5x + y$, $\frac{dy}{dt} = y - 4x$.

3) (3)

A)

Evaluate $\int_0^{\frac{\pi}{2}} \frac{cosx}{1+x} dx$ by Simpson's $\frac{1}{3}$ rule with $h = \frac{\pi}{12}$.

B) (3)

Using modified Euler's method, solve the initial value problem

$\frac{dy}{dx} = log_{10}(x+y)$, $y(0) = 2$ at x = 0.2. Take $h = 0.2$.

C) (4)

Given $y' = y^2 + x$, $y(0) = 1$, find y (0.1) and y (0.2) using Taylor's series method, by considering terms up to x^4.

4) (3)

A) Obtain a real root of the equation 3x +sin x $-e^x = 0$ near $x_0 = 0$ by Newton Raphson method. Carry out four iterations correct to 4 decimal places.

B) (3)

Use Lagrange's interpolation formula to find the value of x when $y = 20$ using the following data:

x	1	2	3	4
y	1	8	27	64

C) (4)

Test for consistency, if consistent solve by Gauss elimination method

$$2x_1 - 2x_2 + 4x_3 + 3x_4 = 9$$

$$x_1 - x_2 + 2x_3 + 2x_4 = 6$$

$$2x_1 - 2x_2 + x_3 + 2x_4 = 3$$

$$x_1 - x_2 + x_4 = 2.$$

5) (3)

A)

Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2e^{3x} + Sin^2x$.

B) (3)

Using Gram-Schmidt process find an orthogonal set of vectors from $\{(1,1,0),(1,0,-2),(1,1,1)\}$.

C) Define minimal spanning set of vectors. Prove that a minimal spanning set of vectors forms a basis. (4)

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