Question Paper

Exam Date & Time: 21-Dec-2018 (08:30 AM - 11:30 AM)

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

FIRST SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, DECEMBER 2018

Engineering Mathematics - I [MAT 1151 - 2018 -PHY/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) Find all the eigenvalues and eigenvector corresponding to largest eigenvalue of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

B) (3)

Use fourth order R-K method find y(0.5) for the equation : $(x+y)\frac{dy}{dx} = 1$, $y(0.4) = 1$ correct to four decimal places. Take h =0.1

C) (4)

Solve by the method of variation of parameters ,

$$\frac{d^2y}{dx^2} - y = \frac{2}{(1+e^x)}$$

2) (3)

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

B) (3)

Solve the system of equations

$$10x + y + z = 12$$

$$x + 10y + z = 12$$

$$x + y + 10z = 12$$

by Jacobi's iterative method. Carry out four iterations up to four decimal places. Take initial approximations $x_0 = 0,\ y_0 = 0,\ z_0 = 0$

C) (4)

Solve $x\,y(1+x\,y^2)\dfrac{dy}{dx} = 1$

3) (3)

A) Using Simpson's 1/3 rule, evaluate the integral $\int_0^1 \dfrac{dx}{1+x^2}$ with 6 sub intervals.

and hence find the value of π.

B) (3)

Solve $(2x-1)^2 \dfrac{d^2y}{dx^2} + (2x-1)\dfrac{dy}{dx} - 2y = 8x^2 - 2x + 3$

C) (4)

Test for consistency and solve

$$x + y + z = 6$$

$$x - y + 2z = 5$$

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

4) (3)

A) Solve $\dfrac{d^2y}{dx^2} - 4\dfrac{dy}{dx} + 4y = 8\,e^{2x}\,x^2 \sin 2x$

B) Define maximal linearly independent set of vectors. Prove that a set of non-zero orthogonal vectors are linearly independent. (3)

C) (4)

Using Lagrange's formula find the value of f(3), given

x	0	1	2	5
f(x)	2	3	12	147

5) Find the root of the equation $x e^x = \cos x$ in the interval (0,1) using the method of false position. Carry out four iterations correct to four decimal places (3)

A)

B) Using Gram-Schmidt process, construct an orthonormal basis vectors from : (2, 3, 0), (6, 1, 0) and (0, 2, 4) (3)

C) (4)

Solve by third order Taylor series method of the equation

$$\frac{dy}{dx} = \frac{x^3 + x y^2}{e^x},\ y(0) = 1 \text{ for } y \text{ at } x = 0.1 \text{ and } x = 0.2$$

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