CBCS SCHEME

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18MTR/MCM/IAE/MAR11

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Applied Mathematics

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. A parachutist of mass 68.1 kg Jumps out of a stationary hot air ballon, use $\frac{dv}{dt} = g - \left(\frac{c}{m}\right)V$ to compute velocity V prior to opening the chute. The drag co-efficient 12.6 kg/sec. Given that $g = 9.81 m/\mu c^2$ $V = 0$ and $t = 0$. **(10 Marks)**

b. Obtain real root of the equation $\cos x = xe^x$ by
i) Regula – Falsi method ii) Newton – Raphson method. **(10 Marks)**

OR

2 a. Obtain a second degree polynomial approximation to $f(x) = \sqrt{(1+x)}$, $x \in [0, 0.1]$ using the Taylor series expansion about $x = 0$. Use the expansion to approximate f(0.05) and find a bound of the transition error. **(10 Marks)**

b. Obtain real root of $e^x = 3x$ by fixed point iteration method correct to three decimal places. **(10 Marks)**

Module-2

3 a. Find the approximate value of the integral **(10 Marks)**
$I = \int_0^1 \frac{dx}{1+x}$ using composite trapezoidal rule with 2, 3, 5, 9 nodes and Romberg integration.

b. Apply Muller's method to find the smaller positive root of the equation $x^3 - 5x + 1 = 0$ in (0, 1) (perform three iterations). **(10 Marks)**

OR

4 a. A rod is rotating in a plane. The following table gives the angle θ (radian) through which the rod has turned for various values of time t (seconds). **(10 Marks)**

t :	0	0.2	0.4	0.6	0.8	1.0
θ :	0	0.12	0.49	1.12	2.02	3.20

Calculate angular velocity and angular acceleration of the rod. When t = 0.6 seconds.

b. Evaluate the Integral $I = \int_0^1 \frac{dx}{1+x}$ using Gauss – Legendre three – point formula. **(10 Marks)**

Module-3

5 a. Using the partition method, solve the system of equations :
$2x + 4y + 3z = 4$: $y + z = 1$; $2x + 2y - z = -2$. **(10 Marks)**

b. Solve the system by Gauss – Jordan method :
$5x_1 + x_2 + x_3 + x_4 = 4$
$x_1 + 7x_2 + x_3 + x_4 = 12$
$x_1 + x_2 + 6x_3 + x_4 = -5$
$x_1 + x_2 + x_3 + 4x_4 = -6$. **(10 Marks)**

OR

6 a. Use triangularisation method to solve the system.
$x+y+z=3$; $2x-y+3z=16$; $3x+y-z=-3$. **(10 Marks)**

b. Solve the system : $x+y+z=6$; $3x+3y+4z=20$; $2x+y+3=13$ by
i) Gauss elimination method ii) Cramer's rule. **(10 Marks)**

Module-4

7 a. Find all the eigen values and eigen vectors of the matrix.

$$A=\begin{bmatrix}1 & \sqrt{2} & 2\\ \sqrt{2} & 3 & \sqrt{2}\\ 2 & \sqrt{2} & 1\end{bmatrix}$$ by Jacobi method. **(10 Marks)**

b. Reduce the matrix in to Tridiagonal form by Given's method.

$$A=\begin{bmatrix}1 & 2 & 4\\ 2 & 1 & 2\\ 4 & 2 & 1\end{bmatrix}.$$ **(10 Marks)**

OR

8 a. Using Power method, find the dominant eigen value and the corresponding eigen vector of the matrix.

$$A=\begin{bmatrix}2 & 1 & 1 & 0\\ 1 & 1 & 0 & 1\\ 1 & 0 & 1 & 1\\ 0 & 1 & 1 & 2\end{bmatrix}.$$ **(10 Marks)**

b. Using the Householder's transformation reduce the matrix

$$A=\begin{bmatrix}2 & 1 & 1\\ 1 & 1 & 0\\ 1 & 0 & 1\end{bmatrix}$$ into a tridiagonal matrix. **(10 Marks)**

Module-5

9 a. Define Linear Transformation. If 'T' is linear transformation then prove that
i) $T(\vec{o})=\vec{o}$ ii) $T(c\,\vec{u}+d\,\vec{v})=CT(\vec{u})+d\,T(\vec{v})$. **(10 Marks)**

b. Find the least – square solution of the system $AX=B$ for

$$A=\begin{bmatrix}4 & 0\\ 0 & 2\\ 1 & 1\end{bmatrix},\quad B=\begin{bmatrix}2\\ 0\\ 11\end{bmatrix}.$$ **(10 Marks)**

OR

10 a. Show that $\{\vec{V}_1, \vec{V}_2, \vec{V}_3\}$ is an orthogonal basis of R^3. Where

$$\vec{V}_1=\left[\frac{3}{\sqrt{11}}\ \frac{1}{\sqrt{11}}\ \frac{1}{\sqrt{11}}\right]^T\quad \vec{V}_2=\left[\frac{-1}{\sqrt{6}}\ \frac{2}{\sqrt{6}}\ \frac{1}{\sqrt{6}}\right]^T\quad \vec{V}_3=\left[\frac{-1}{\sqrt{66}}\ \frac{-4}{\sqrt{66}}\ \frac{7}{\sqrt{66}}\right]^T.$$ **(10 Marks)**

b. Find QR factorization of

$$A=\begin{bmatrix}1 & 0 & 0\\ 1 & 1 & 0\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}.$$ **(10 Marks)**

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