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14MAR/MAU/IAE/MDE/MMD/MST/MTH/MTE/MTP/ MTR/MCM/MEA/CAE11

First Semester M.Tech. Degree Examination, June/July 2016
Applied Mathematics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. Evaluate the sum $S=\sqrt{3}+\sqrt{5}+\sqrt{7}$ to four significant digits and find its absolute and relative errors. **(07 Marks)**

b. A parachutist of mass 68.1 kg jumps out a stationary hot air balloon. Use equation $v(t)=\frac{gm}{C}\left[1-e^{-\left(c/m\right)t}\right]$ to compute velocity prior to opening the chutes. The drag co-efficient is equal to 12.5 kg/s. **(07 Marks)**

c. The Maclaurin's expansion for e^x is given by $e^x=1+x+\frac{x^2}{2!}+\text{------}+\frac{x^{n-1}}{(n-1)!}+\frac{x^n}{n!}e^r$, find 'n' such that he sum yields the value of e^x correct to 8 decimal places at x = 1. **(06 Marks)**

2 a. Find a root of the equation $xe^x=\cos x$ correct to four decimal places by Regula – False method. **(10 Marks)**

b. Discuss Newton – Raphson method with the graph to find the root of the equation f(x) = 0. Use this method to find the root of the equation $X\log_{10}^{x}-1.2=0$. Take the initial of x as 2. **(10 Marks)**

3 a. Perform one iteration of the Bairstow method to extract a quadratic factor x^2+px+q from the polynomial $x^4+x^3+2x^2+x+1=0$ using initial approximation p = 0.5, q = 0.5. **(10 Marks)**

b. Find all the roots of the polynomial $x^4-x^3+3x^2+x-4=0$ using Graeffe's root squaring method, squaring thrice. **(10 Marks)**

4 a. Calculate first and second derivatives of the function tabulated in the following table at the point x = 2.2 and also find $\frac{dy}{dx}$ at x = 2.0. **(10 Marks)**

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7083	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

b. Evaluate $\int_0^1\frac{dx}{1+x^2}$ using Romberg's method correct to four decimal places with h = 0.5, h = 0.25 and h = 0.125. **(10 Marks)**

5 a. Solve the following system of equations by the Gauss – Jordan method :

$x_1+x_2+x_3+x_4==2$
$2x_1-x_2+2x_3-x_4=-5$
$3x_1+2x_2+3x_3+4x_4=7$
$x_1-2x_2-3x_3+2x_4=5.$ **(10 Marks)**

b. Find the inverse of the matrix $A=\begin{bmatrix}3&2&1\\2&3&2\\1&2&2\end{bmatrix}$, using partition method. **(10 Marks)**

6 a. Using Jacobi method find all the eigen values and the corresponding eigen vectors of the matrix $A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$. **(10 Marks)**

b. Reduce the matrix $\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$ into tridiagonal form using householder's transformation and hence find its all eigen values. **(10 Marks)**

7 a. Define linear transformation, onto and one – one transformation. IF $T : \mathbb{R}^n \to \mathbb{R}^m$ be a linear transformation with A as the standard matrix for T, then prove that :

i) T maps $\mathbb{R}^n$ onto $\mathbb{R}^m$ if and only if columns of A span $\mathbb{R}^m$

ii) T is one – one if and only if columns of A are linearly independent. **(10 Marks)**

b. Given $A = \begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 7 \end{bmatrix}$ $u = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$ $b = \begin{bmatrix} 3 \\ 2 \\ -5 \end{bmatrix}$ $c = \begin{bmatrix} 3 \\ 2 \\ 5 \end{bmatrix}$ and define the transformation $T : \mathbb{R}^2 \to \mathbb{R}^3$ by $T(x) = AX$

i) Find T(u)

ii) Find an X in $\mathbb{R}^2$, T(X) = b

iii) Is there more than one X, whose image under T is b?

iv) Determine if C is the range of transformation T. **(10 Marks)**

8 a. Explain the Gram–Schmidt process of obtaining orthogonal basis for given basis $\{x_1, x_2, \text{----} x_p\}$ for subspace W of $\mathbb{R}^n$ and hence obtain orthonormal basis for $\{x_1, x_2, x_3\}$ where $X_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$ $X_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \\ 1 \end{bmatrix}$ $X_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \\ 1 \end{bmatrix}$. **(10 Marks)**

b. Find a least square solution of the inconsistent system AX = b $A = \begin{bmatrix} 4 & 0 \\ 0 & 2 \\ 1 & 1 \end{bmatrix}$ $b = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$ and also determine least square error. **(10 Marks)**

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