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RB-3617

M.A. / M.Sc. (Part-II) Examination

April / May – 2010

Mathematics

5022 (Numerical Analysis & Math. Software

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M.A. / M.Sc. (Part-2)**

Name of the Subject :

☛ **Mathematics**

☛ Subject Code No. : **3 6 1 7** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Answer **all** questions.

(3) **All** questions carry **equal** marks.

(4) Follow **usual** notations.

1 (a) Find a real root of the equation $\cos(x)-3x-1=0$ using bisection method working up to three places of decimals.

(b) Explain Jordan method to find the inverse of a matrix A and use it to find the inverse of the matrix

$$\begin{bmatrix} 1 & 3 & 4 \\ 2 & 4 & 6 \\ 3 & 5 & 9 \end{bmatrix}.$$

(c) Using method of least square fit a 2^{nd} degree polynomial to the following data :

X	0	1	2	3	4
Y	1	2.9	6.95	13.05	22.0

OR

1 (a) Find a positive root of the equation $x^3 + x^2 - 1 = 0$ using Newton–Raphson's method correct up to 4 places of decimals.

(b) Solve the following system of equations using LU factorization :

$10x + y - z = 9;\ 3x + y + 5z = 20;\ 4x + 3y + 2z = 16.$

(c) Find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 4 \\ 2 & 4 & 9 \end{bmatrix}$ using Choleski's method.

2 (a) Solve the following system of equations using Gauss Seidal method working up to three places of decimals :

$8x + y + z = 17;\ x + 10y + 2z = 12;\ 3x + 4y + 9z = 10.$

(b) Find all eigen values and eigen vectors of the matrix

$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$ using Jacobi method.

(c) Find absolutely smallest eigen value of the matrix

$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ using power method working up to three places of decimals.

OR

2 (a) Explain the process of pivotal condensation in solving the system of equations Ax=B using Gauss elimination method.

(b) If $\lambda_1, \lambda_2, \ldots\ldots \lambda_n$ are eigen values of the matrix A, prove that $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \ldots\ldots \frac{1}{\lambda_n}$ are eigen values of the matrix A^{-1} and $\lambda_1^2, \lambda_2^2, \ldots\ldots \lambda_n^2$ are the eigen values of the matrix A^2.

(c) Solve the following system of equations using Jacobi method working up to three places of decimals :

$8x-3y+2z=20,\ 4x+11y-z=33,\ 6x+3y+12z=35.$

3 (a) Describe Range Kutta 2nd ordered method to solve a given initial value problem. Also find error bounds for this method.

(b) Using Newton – Raphson's method, solve the following system of simultaneous nonlinear equations :

$x^2+y^2-4=0$

$x^2-y^2-1.5=0$ starting from $x=1, y=1$.

(c) Solving the boundary value problem

$y''-64y+10=0, y(0)=0=y(1)$ using finite difference method.

OR

3 (a) Given $\frac{dy}{dx}=x^2(1+y), y(1)=1, y(1.1)=1.233;$

$y(1.2)=1.548, y(1.3)=1.979$, evaluate $y(1.4)$ using Milne's predictor corrector method.

(b) Solve the boundary value problem

$u''=u+x, u(0)=0=u(1)$ with $h=\frac{1}{4}$ using 2nd order method.

(c) Explain Newton – Raphson's method for solving system of nonlinear equations.

4 (a) Write a Matlab program to find a real root of f(x)=0 using Regula-falsi method.

(b) Write short notes on following :

(i) Relation Operations

(ii) Difference between function and Script files.

(c) Write a Matlab program to find a factorial of given positive integer.

OR

4 (a) Write a Matlab program to find a real roof of f(x)=0 using Secant method.

(b) Write a Matlab programme to arrange the inputed n elements in the ascending and descending order by selection sort method.

(c) The function $f(x)$ and $g(x)$ are defined by $f(x)=\frac{x}{1+x^2}$ and $g(x)=\tan x$. Write Matlab codes to calculate these functions and plot them on the interval $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$.

5 (a) Explain the various control structures in Matlab.

(b) Write the m-file program for numerical integration by Trapezoidal rule.

(c) Write the output of the following Matlab commands :

```
A = ones (4,1)
s = size (A)
B = [1;2;3]
A[:, s(2)]=B
```

OR

5 (a) Write a Matlab program to solve the system of linear equations using Gauss-Jacobi method.

(b) Write the m-file program for numerical integration by Simpson's 3/8 rule.

(c) Write syntax of "if.....else" and explain how it is executed.