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SUBJECT CODE NO:- B-2169
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. S.Y (Sem.-IV) Examination OCT/NOV 2019
Mathematics MAT - 401
Numerical Methods

[Time: 1:30 Hours] **[Max.Marks:50]**

Please check whether you have got the right question paper.

N.B
i) Attempt all questions
ii) Figures to the right indicate full marks
iii) Use of non-programmable calculator and logarithmic table is allowed

Q.1 A) Attempt any one: 08

a) Explain the method of false position for obtaining root of an equation f (x) = 0.
b) Derive Lagrange's interpolation formula.

B) Attempt any one: 07

c) Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ by using Bisection method.
d) The population of a town in the decennial census was as given below. Estimate the population for the year 1895.

Year:x	1891	1901	1911	1921	1931
Population: y (In thousands)	46	66	81	93	101

Q.2 A) Attempt any one : 08

a) Prove that: $\mu \equiv \sqrt{1 + \frac{1}{4}\delta^2}$ with usual notations.
b) Explain the method of fitting the data points (xi, yi), i=1, 2,……..,m to a polynomial of the n^{th} degree.

B) Attempt any one: 07

c) Economize the power series

$$sinx \approx x - \frac{x^3}{6} + \frac{x^5}{120} - \frac{x^7}{5040}$$

d) Find the eigenvalues and eigenvectors of the matrix

$$A=\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

Q.3 A) Attempt any one: 05

a) Describe the method to determine eigenvalues of symmetric tridiagonal matrix.
b) Explain the Euler's method to find solution of a differential equation $y' = f(x, y)$.

B) Attempt Any One: 05

c) Solve the system of equations
5x-2y+z=4
7x+y-5z=8
3x+7y+4z=10
By using Gaussian elimination method.

d) Solve the equation
$y' = x + y^2$, Subject to the condition y=1 when x=0 using picard's method of successive approximations.

Q.4 Choose the correct alternative and rewrite the sentence. 10

i) If a function f(x) is continuous between a and b then there exists at least one root of f(x)=0 between a and b if _____ .
a) f(a)>0 and f(b)>0
b) f(a)<0 and f(b)<0
c) f(a) and f(b) are of opposite signs.
d) f(a) f(b)=0

ii) $E^5 Y_2$= _____ , where E is shift operator
a) Y_7 b)Y_5 c) Y_3 d) Y_2

iii) The chebyshev polynomial of degree 2 is _____
a) $2x^2 + 1$ b) $2x^2 - 1$ c) $2x^2 + 2$ d) $2x^2 - 2$

iv) Eigenvalues of the matrix
$\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ are _____.

a) 1, 4 b) 2, 3 c) 1, 3 d) -1, -3

v) If $\frac{dy}{dx} = y - x, y(o) = 2$, then by second order Runge-kutta formula with h=0.1 K_1= _____.
a) 2 b) -2 c) -0.2 d) 0.2