Code No. 1520 / E

FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. III-Year Examination, March / April 2014

Subject : Mathematics
Paper – IV(a) : Numerical Analysis

Time : 3 Hours **Max. Marks : 100**

Note: Answer six questions from Section-A and four questions from Section-B. choosing atleast one from each unit. Each question in Section-A carries six marks and in Section-B carries 16 marks.

Section – A (6 x 6 = 36 Marks)

Unit-I

1 Explain Bisection method to find a real root of the equation f(x)=0.

2 Use Newton-Raphson method to obtain a root of the equation sinx= $\frac{1}{2}$ x correct to three decimal places.

Unit-II

3 Prove that the third order divided difference of the function f(x) = $\frac{1}{x}$ with arguments a, b, c, d is $\frac{-1}{abcd}$.

4 The population of a town in the decennial census was as given below. Estimate the population for the year 1955.

Year x	1951	1961	1971	1981	1991
Population y (in thousands)	46	66	81	93	101

Unit-III

5 Find the values of a_o and a_1 such that $y = a_o + a_1 x$ fits the data given in the following table.

x	0	1	2	3	4
y	1.0	2.9	4.8	6.7	8.6

6 Find the value of $\int_3^7 x^2 \log x \, dx$ by taking 8 strips using Boole's rule.

Unit-IV

7 Explain Gauss-Seidel method of solving a system of linear equations.

8 Given $\frac{dy}{dx} = 1 + xy$ and y(0)=1, obtain the Taylor's series for y(x) and compute y(0.1) correct to four decimal places.

Section-B (4 x 16 = 64 Marks)

Unit-I

9 (a) Explain generalized Newton's method to determine a root of the equation f(x)=0 with multiplicity p.
(b) Use Newton-Raphson method to obtain a root of the equation x^2-18=0 correct to three decimal places.

10 (a) Describe Ramanujan's method to determine the smallest root of the equation f(x)=0.
(b) Find a root of the equation sinx = 1 - x by Ramanujan's method.

Unit-II

11 (a) Derive Newton's general interpolation formula with divided differences.
(b) Use Stirling's formula to find u_{32} from the following data: u_{20}=14.035 ; u_{25}=13.674; u_{30}=13.257 ; u_{35}=12.734 ; u_{40}=12.089 ; u_{45}=11.3039

12 (a) Derive Gauss's forward formula for interpolation.
(b) Applying Lagrange's formula, find a cubic polynomial which approximates the following data:

x	-2	-1	2	3
y(x)	-12	-8	3	5

Unit-III

13 (a) Derive the normal equations to fit a straight line to the given data.
(b) Find $\frac{dy}{dx}$ at x = 3 from the following table :

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

14 (a) Derive the general formula to obtain an approximate value of the definite integral $\int_a^b y \, dx$.

(b) Derive Simpson's $\frac{3}{8}$ rule and use this to evaluate $\int_0^1 \frac{1}{1+x} dx$ with $h = \frac{1}{6}$.

Unit-IV

15 (a) Describe Jacobi's iteration method to solve the following system of linear equations:
$a_{11}x_1+a_{12}x_2+a_{13}x_3=b_1$ $a_{21}x_1+a_{22}x_2+a_{23}x_3=b_2$ $a_{31}x_1+a_{32}x_2+a_{33}x_3=b_3$
(b) Apply Gauss – Seidel iterative method to solve the system of equations : 27x + 6y-z = 85 ; 6x + 15y + 2z = 72 ; x + y + 54z = 110.

16 (a) Explain the method of solving the differential equation y'=f(x, y), $y(x_0)=y_0$ by Taylor's series method.
(b) Use Runge-Kutta fourth order method to find y(0.2) given y(0)=1 and y'=3x+ $\frac{1}{2}$ y.

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