**35538/E 380**

Reg. No. | | | | | | | | |

# V Semester B.Sc. 3 Degree Examination, November/December 2018
## MATHEMATICS (Optional)
## P–II : Numerical Analysis
## (Regular w.e.f. 2016-17)

Time : 3 Hours Max. Marks : 80

***Instructions :*** ***1) Answer all questions.***

***2) Students are allowed to use scientific calculators.***

PART – A

1. Answer **any ten** of the following : **(10×2=20)**
   a) Explain briefly bisection method to find real root of f(x) = 0.
   b) Deduce the iterative formula to find square root of a number N.
   c) With usual notation, prove that $\nabla = E^{-1}\Delta$.
   d) Given $f(x) = x^2 - x + 1$, form backward difference table taking x = 0, 1, 2, 3. Hence find $\nabla f(2)$ and $\nabla^2 f(3)$.
   e) Evaluate $\Delta^6 (ax - 1)(bx^2 - 1)(cx^3 - 1)$, where h = 1.
   f) Write the formula to find the first derivative using backward difference.
   g) State Simpson's one-third rule to evaluate $\int_a^b f(x)\,dx$. .
   h) From the Taylor's series for y(x), find 'y' at x = 0.1, correct to 4 decimal places if y(x) satisfies $y' = x - y^2$ and y(0) = 1.
   i) Explain Euler's method to solve the equation $\frac{dy}{dx} = f(x, y)$ with initial condition $y(x_0) = y_0$.
   j) Find the order of the difference equation $y_{n+3} - 3y_{n+2} + 6y_{n+1} - 4y_n = 1$.
   k) Form the difference equation by eliminating a and b from the relation $y_x = (ax + b)\,3^x$.
   l) Solve $u_{n+2} - 25u_{n+1} + 46\,u_n = 0$ by the method of differences.

PART – B

Answer **any four** of the following : **(4×5=20)**

2. Solve by Gauss-Seidal iteration method. Carry out 4 iterations.
   $28x + 4y - z = 32, \quad x + 3y + 10z = 24, \quad 2x + 17y + 4z = 35.$
3. Express $f(x) = 2x^3 - 3x^2 + 3x - 10$ and its differences in factorial notation, the interval of differencing being unity.
4. State and prove Lagranges interpolation formula for unequal intervals.
5. Evaluate $\int_0^1 \frac{dx}{1 + x^2}$ using Simpson's $(3/8)^{th}$ rule by taking $\tau$ ordinates and hence find approximate value of $\pi$.

**P.T.O.**

6. Determine the value of y when x = 0.1, given that y(0) = 1 and $y' = x^2 + y$ by taking h = 0.05, using modified Euler's method.
7. Solve $y_{x+2} - 4y_{x+1} + 4y_x = ax + b$.

PART – C

Answer **any four full** questions. **(4×10=40)**

8. a) Explain Newton-Raphson method of finding real root of f(x) = 0.
   b) Find the root of $x^3 + x - 1 = 0$, by iteration method, given that the root lies near 1, carry out 3 iterations.
9. a) Prove that the $n^{th}$ difference of a polynomial of degree 'n' is a constant proportional to 'n' and higher order differences are zero.
   b) Find a polynomial of $3^{rd}$ degree which takes the following values

| **x** | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| **f(x)** | 6 | 24 | 60 | 120 | 210 |

10. a) Derive 'General Quadrature Formula' for equidistant ordinates and hence deduce Trapezoidal rule from it.
    b) From the following data find f′(1) and f″(3) and verify your answer by fitting interpolating polynomial.

| **x** | 0 | 2 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| **f(x)** | 7 | 13 | 43 | 145 | 367 |

11. a) Explain Picard's method to solve the equation $\frac{dy}{dx} = f(x, y)$ with initial condition $y(x_0) = y_0$.
    b) Using Runge-Kutta method of order 2, compute y(0.2) from $y' = x + y^2$, y(0) = 1 by taking h = 0.2.
12. a) By using the method of differences, solve $y(x + 2) - 3y(x + 1) - 4y(x) = 2^x$.
    b) Solve $y(x + 2) - 10\, y(x + 1) + 25y(x) = 0$ by the method of differences using y(0) = 1 and y(1) = 0.

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