35538/E 380

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

V Semester B.Sc.3 Degree Examination, Nov./Dec. 2016
MATHEMATICS (Optional)
Paper – II : Numerical Analysis
(Regular – w.e.f. 2016-17) (Fresh New Syllabus)

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 the real root of the equation f(x) = 0.

b) Find the real root of 3x – 2 = cos x using iteration method in three stages.

c) Prove that $\Delta - \nabla = \Delta \cdot \nabla$.

d) Express $f(x) = 2x^3 - 3x^2 + 3x - 10$ in factorial notation.

e) State Newton-Gregory backward interpolation formula.

f) Write the formula to find the second derivative using forward difference.

g) Evaluate $\int_0^1 e^x dx$ using Trapezoidal rule by taking h = 0.5.

h) State Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to evaluate $\int_a^b f(x)dx$.

i) Explain the Picard's method to solve the initial value problem of first order ordinary differential equations.

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j) Write the general formula to solve $\frac{dy}{dx} = f(x, y)$ with $y(x_0) = y_0$ using Runge-Kutta method.

k) Define general and particular solution of a difference equation.

l) Show that $y_x = \frac{1}{2}x(x-1) + c$ is the solution of $y_{x+1} - y_x = x$.

PART – B

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

2. Find a real root of $x^3 - x - 1 = 0$ using bisection method in five stages.

3. Explain the Gauss-Seidal method to solve the equations :

$a_1x + b_1 y + c_1 z = d_1$

$a_2x + b_2 y + c_2 z = d_2$

$a_3x + b_3 y + c_3 z = d_3$

4. State and prove Newton-Gregory forward interpolation formula.

5. Using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule, evaluate $\int_0^1 \frac{dx}{1+x^2}$ by taking 7 ordinates.

6. Using Taylor's series, find the solution of $x\frac{dy}{dx} = x - y, y(2) = 2$ at $x = 2.1$ correct to five decimal places.

7. Form the difference equation by eliminating arbitrary constants from $u_x = A.2^x + B.3^x$.

PART – C

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

8. a) Derive the Newton-Raphson's formula $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$.

b) Solve : $20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$ by Jacobi iteration method.

9. a) State and prove Lagrange's interpolation formula for unequal intervals.

   b) The population of a town is as follows :

Year	1921	1931	1941	1951	1961	1971
Population in Lakhs	20	24	29	36	46	51

   Estimate the increase in population during the period 1955 to 1961.

10. a) State and prove 'General Quadrature' formula for equidistant ordinate.

   b) Find $f'(1.1)$ and $f''(1.1)$ given that

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
f(x)	7.989	8.403	8.781	9.129	9.451	9.750	10.031

11. a) Explain the modified Euler's method to solve the equation $\frac{dy}{dx} = f(x, y)$ with initial condition $y = y_0$ at $x = x_0$.

   b) Solve $\frac{dy}{dx} = x + y^2$ with initial condition $y = 1$ when $x = 0$ for $x = 0.4$ by taking $h = 0.2$ by Runge-Kutta method.

12. a) Solve the equation :

   $u_{x+2} - 7u_{x+1} + 10u_x = 12.4^x$.

   b) Find the complete solution of

   $y_{x+2} + y_{x+1} + y_x = x^2 + x + 1$.
