SLR-SC – 8

Seat No.	

Set P

B.Sc. (ECS) – I (Semester – I) (CBCS Pattern) Examination, 2018
MATHEMATICS
Numerical Methods (Paper – VII)

Day and Date : Friday, 6-4-2018 Max. Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Use of scientific calculator is ***allowed****.*

1. Choose the correct alternative : **14**

1) The one of the roots of the equation $f(x) = x^2 - 4x - 10 = 0$ lies in the interval
a) (5, 6) b) (–1, 0) c) (4, 5) d) (3, 4)

2) The value of $\Delta^n e^x$ = _____ by taking h = 1.
a) $(e-1)^n e^x$ b) $(e+1)^n e^x$ c) e^{nx} d) $(e-1)e^x$

3) If all the variables of system of linear equations are leading variables, then the system possess _____ solutions.
a) no b) two c) infinitely many d) unique

4) While doing multiplication of two numbers in normalised floating point notation, the mantissa's should be
a) multiplied b) subtracted c) added d) made equal

5) Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule is obtained by putting n = _____ in the general quandrature formula.
a) 0 b) 1 c) 3 d) none of these

6) _____ method is used to solve ordinary differential equation.
a) Taylor's series b) Gauss-Seidel
c) Bisection d) Regula-Falsi

7) Which of the following relation is true ?
a) $E^{-1} = 1+\Delta$ b) $E = 1+\nabla$ c) $E = 1+\Delta$ d) $E = 1-\Delta$

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8) The next iterative value of the root $x^2 - 4 = 0$ by using Newton-Raphson method, is the initial guess of root is 3 is
   a) 2.1667 b) 2.0167 c) 1.5116 d) 3.0016

9) Interpolation means estimating a value which lies
   a) Outside the range of the dependant variables
   b) Outside the given range of arguments
   c) Within the given range of arguments
   d) None of these

10) 0.8467 E3 $\times$ 0.9876 E4 =
   a) 0.8362 E7 b) 8.3620 E7
   c) 0.8362 E12 d) 0.8362 E–1

11) If Runge-Kutta IVth order method K_2 =
   a) $hf(x_0, y_0)$ b) $hf(x_0 + h, y_0 + k_1)$
   c) $f(x_0 + h, y_0 + k_1)$ d) $h.f(x_0, y_0 + k_1)$

12) Homogeneous system of linear equations is
   a) always inconsistent b) never consistent
   c) always consistent d) both (b) and (c)

13) _____ method is used to accelerate the convergence of iterative methods.
   a) Aitken's process b) Newton-Raphson
   c) Taylor's d) Lagrange's

14) The equations which include trignometric, exponential and logarithmic funcitons are known as _____ equations.
   a) polynomial b) algebraic
   c) special d) transcendental

2. Attempt **any seven** of the following : **14**

1) Prove that $E\nabla = \Delta$.

2) Write augmented matrix representing the following system of linear equations.
   $3x + 2y - 5z = -7$; $-3x + 7y = 0$; $y + 5z - 5 = 0$.

3) State general quadrature formula for equidistant ordinates.

4) State Lagrange's interpolation formula for 4 ordinates. **Set P**

5) State the formulae to find k_1 and k_4, in Runge-Kutta IVth order method.

6) Find first approximate value for the root of equation $f(x) = x^2 - 3x + 2$ by using Newton- Raphson method. Take initial approximation $x_0 = 0$.

7) Define absolute error.

8) Find the interval in which one of the roots of equation $x^3 - 36.28 = 0$ lies.

9) Prepare the forward difference table for the following data.

x	5	10	15	20
y = f(x)	0.9869	0.6872	0.7802	0.5999

3. A) Attempt **any two** of the following : **10**

1) Solve the following system of linear equations by using Gauss elimination method.
$2x + 3y - z = 6$; $x - y + 2z = 3$; $x + y + z = 4$.

2) Solve $\frac{dy}{dx} = 1 + xy$ by using Taylor's series method. Given that $x_0 = 1$, $y_0 = 2.1$. Find y(1.5) in one step.

3) Derive Newton-Raphson formula to find root of the equation $f(x) = 0$.

B) Evaluate the following. Write your answers in normalised floating point form. **4**

i) 0.7656 E5 + 0.6896 E4

ii) 0.8692 E3 – 0.4653 E2

iii) 3.14 28 E – 2 $\times$ 2.1819 E4

iv) 0.7172 E5 $\div$ 0.2160 E – 3

4. Attempt **any two** of the following : **14**

1) Evaluate $\int_0^{\pi/2} \cos x.dx$ by using simpson's $\left(\frac{1}{3}\right)^{rd}$ rule, by dividing the interval into 8 equal parts.

2) Derive Newton's Forward difference interpolation formula.

3) Use Euler's method to estimate y(0.1) in 4-steps for the differential equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ with initial conditions $x_0 = 0$, $y_0 = 1$.

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5. Attempt **any two** of the following : **14**

1) By using Lagrange's interpolation formula estimate the value of f(2.5) from the data given below :

x	–1	1	2	3
y = f(x)	–25	11	8	–1

2) Write an algorithm to solve system of 'm' linear equations in 'n' variables by using Gaussian Elimination method.

3) Find approximate value of root of the equation.
$f(x) = e^x - 4x = 0$ by using Regula-Falsi method. Perform only three iterations.
