REV-00
MSM/44/50

2017/12

M. Sc. MATHEMATICS
FIRST SEMESTER
NUMERICAL ANALYSIS
MSM - 104

Duration: 3 Hrs. **Marks: 70**

Part : A (Objective) = 20
Part : B (Descriptive) = 50

[PART-B : Descriptive]

Duration: 2 Hrs. 40 Mins. **Marks: 50**

[Answer question no. One (1) & any four (4) from the rest]

1. State and prove the fundamental theorem of differential calculus. A third degree polynomial passes through (0,-1),(1,1), (2,1), and (3,-2). Find the polynomial. 10

2. Given $log_{10}654 = 2.8156, log_{10}658 = 2.8182, log_{10}659 = 2.8189, log_{10}661 = 2.8202$ find $log_{10}656$. By means of Lagrange's formula prove that 10
$$y_1 = y_3 - .3(y_5 - y_{-3}) + .2(y_{-3} - y_{-5})$$

3. Deduce Lagrange's Interpolation formula.Mention the properties of Divided Differences. Prove that Divided differences are symmetric functions of their arguments. 5+5=10

4. Derive general quadrature formula, Simpson's one third rule, Simpson's three-eight rule. 4+3+3 =10

5. Use Euler's modified method to compute y for x= 0.05, and x=0.1. Given that $\frac{dy}{dx} = x + y$ with the initial condition $x_0 = 0, y_0 = 1.$ 5+5=10

6. Deduce Newton Raphson method. Find the real root of the equation $x^2 + 4sinx - 0$ correct to four places of decimal by using Newton Raphson method. 5+5=10

7. State Bisection method and describe it. Find a real root of the equation $x^3 - x - 1 = 0$. 2+4+4 =10

8. Evaluate $\int_{0.5}^{0.7} x^{\frac{1}{2}} e^{-x} dx$ using Simpson's 1/3 rd rule dividing the range of integration into 4 equal parts. 10

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[PART-A : Objective]

Choose the correct answer from the following : 1×20=20

1. The graph of the function y=f(x) , where f(x) is a real valued function in the interval $a \leq x \leq b$ and f(a) and f(b) have opposite signs crosses the x axis
   a. Odd number of times
   b. Even number of times
   c. once
   d. None of them

2. The method used to solve the given equation F(x)=0 which is an algebraic or transcendental equation is
   a. Iterative method
   b. Discrete method
   c. Difference method
   d. None of them

3. If the given polynomial is of odd degree, then the equation f(x)=0 has
   a. No root
   b. Atleast one real root
   c. Two roots
   d. None of these

4. Newton Raphson method is a____ method.
   a. Graphical
   b. Transcendental
   c. Forward Interpoltaion
   d. None of these

5. Rate of convergence of Newton's method is
   a. Cubic
   b. Biquadratic
   c. Infinite
   d. None of these

6. The general quadrature formula in numerical integration is of ___ ordinates
   a. Different
   b. Hypothetical
   c. Unequal
   d. None of these

7. In general quadrature formula for deriving Simpsons one-third rule we put the value of n as
   a. 1
   b. 2
   c. 3
   d. 5

8. In general quadrature formula for deriving Simpsons three -eighth rule we put the value of n as
   a. 2
   b. 4
   c. 3
   d. None of these

9. In general quadrature formula for deriving Weddle's rule we put the value of n as
   a. 2
   b. 4
   c. 5
   d. None of these

10. Problems which involve second order differential equation are known as
    a. Boundary value problem
    b. Initial value problem
    c. Equidistant problem
    d. All of these

11. Euler's method starts with _____ differential equation.
    a. Boundary value problem
    b. Initial value problem
    c. Equidistant problem
    d. All of these

12. Modified Euler's method is a method of numerically accurate solving of _____.
    a. Integral equation
    b. Cubic equation
    c. Both of these
    d. None of these

13. In the Euler's method equation $y_{n+1} = y_n + hf(x_n, y_n)$, the value of n starts from
    a. n
    b. 0
    c. n+1
    d. 1

14. In the initial equation of Euler's method i.e $\frac{dy}{dx} = f(x, y), \quad y(x_0)$ is equal to
    a. 1
    b. y_n
    c. y_1
    d. None of these

15. If $D = x\frac{d}{dx}$, then $e^D f(x)$ is

a. $f(x+h)$

b. $f(\frac{1}{x})$

c. f(e^x)

d. 0

16. The value of any divided difference is _____ of the order of arguements
    a. Dependent
    b. Independent
    c. Free
    d. None of these

17. The value of $\Delta^n x^{(n)}$ is
    a. $n!\,n^h$
    b. nh
    c. $n\,h^n$
    d. None of these

18. $E^n f(a) = (I + \Delta)^n f(a)$ is the formulae which enables us to find out _____ differences
    a. (n-1) th differences
    b. (n+1) th differences
    c. n th differences
    d. None of these

19. Δ^2 represents that the operation of differences has been done
    a. thrice
    b. twice
    c. once
    d. None of these

20. $f(a + nh) - f\{a + (n-1)h\}$ is an example of
    a. second difference
    b. nth difference
    c. first difference
    d. None of these

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UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

[PART (A) : OBJECTIVE]

Duration : 20 Minutes

Serial no. of the main Answer sheet

Course : .....

Semester : ..... Roll No : .....

Enrollment No : ..... Course code : .....

Course Title : .....

Session : 2017-18 Date : .....

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Instructions / Guidelines

- The paper contains twenty (20) / ten (10) questions.
- Students shall tick (✓) the correct answer.
- No marks shall be given for overwrite / erasing.
- Students have to submit the Objective Part (Part-A) to the invigilator just after completion of the allotted time from the starting of examination.

Full Marks	Marks Obtained
20	

Scrutinizer's Signature *Examiner's Signature* *Invigilator's Signature*