Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number____________________________

Course__________________________ Semester______________________

Paper Code________________Paper Title_________________________________

Type of Exam: ____________________________ (Regular/Back/Improvement)

<u>Important Instruction for students:</u>

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1^{st} page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. (2019MBA15) and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

MASTER of COMPUTER APPLICATION
THIRD SEMESTER
COMPUTER ORIENTED NUMERICAL METHODS
MCA – 301

Duration : 3 hrs. **Full Marks : 70**

[PART-A: Objective]

Time : 20 min. **Marks : 20**

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

1. Shifting operator of E can be written as
   - a. $E = I + \Delta$
   - b. f(x)=x+h
   - c. $E = I - \Delta$
   - d. Cauchy

2. If Δ and ∇ be the first descending and ascending differential operator respectively of function f(x) , then $\Delta\ \nabla$ is
   - a. Δ/∇
   - b. $\Delta-\nabla$
   - c. $\Delta + \nabla$
   - d. None of these

3. 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 atleast
   - a. Once
   - b. Thrice
   - c. Twice
   - d. None of these

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

5. The nth approximation of Picard's method is given by
   - a. $y^n = y_0 + \int_{x0}^{x} f(x, y^n)dx$
   - b. $y^n = y_0 + \int_{x0}^{x} f(x, y^0)dx$
   - c. $y^n = y_0 + \int_{x0}^{x} f(x, y^{n-1})dx$
   - d. None of these

6. Problems where conditions are specified at two or more points are known as
   - a. Initial value problem
   - b. Boundary value problem
   - c. Both of these
   - d. None of this

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

8. In general quadrature formula for deriving Simpsons one-third rule we put the value of n as
   - a. 1
   - b. 2
   - c. 3
   - d. None

9. Problems which involve second order differential equation are known as
   - a. Boundary value problem
   - b. Equidistant problem
   - c. Initial value problem
   - d. None of these

10. In Newton's Divided difference formula, if the function f(x) is expressible as a polynomial of ____ degree then the remainder term vanishes.
    - a. (n+1)th
    - b. n^{th}
    - c. (n-1)th
    - d. None of them

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

12. The value of factorial notation $x^{(n)}$ is
    - a. $\frac{x\,!}{(x+n)\,!}$
    - b. $\frac{(x+n)\,!}{x!}$
    - c. $\frac{x\,!}{(x-n)\,!}$
    - d. $\frac{(x-n)\,!}{x\,!}$

13. Modified Euler's method for two successive y's are computed using the formula
    - a. $y_{n+1} = y_{n-1} + 2hy_n'$
    - b. Both of these
    - c. $y_{n+1} = y_n + 2hy_n'$
    - d. None of these

14. Euler's method starts with ______ differential equation.
    - a. Boundary value problem
    - b. Equidistant problem
    - c. Initial value problem
    - d. None of these

15. The range (a,b) in a General Quadrature formula can be divided into n equal parts each of width _____
    - a. nh
    - b. (n+1)h
    - c. h
    - d. None of these

16. 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

17. Modified Euler's method is a method of numerically accurate solving of _____.

a. Integral equations
b. Cubic equation
c. Both of these
d. None of these

18. In the initial equation of Euler's method i.e $\frac{dy}{dx} = f\,(x, y),\;\; y(x_0)$ is equal to

a. y_n
b. y_1
c. Both of these
d. None of these

19. $E^n fa) = (I + \Delta)^n f(a)$ is the formulae which enables us to find out ______ differences

a. (n-1) th differences
b. n th differences
c. (n+1) th differences
d. None of these

20. $f(a + nh) - f\{a + (n-1)h\}$ is an example of

a. second difference
b. first difference
c. nth difference
d. All of these

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PART-B : Descriptive

Time : 2 hrs. 40 min. **Marks : 50**

[Answer question no.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. **5+5=10**

2. Given **5+5=10**

   $log_{10}654 = 2.8156, log_{10}658 = 2.8182, log_{10}659 = 2.8189, log_{10}661 = 2.8202$

   find $log_{10}656$. By means of Lagrange's formula prove that

   $y_1 = y_3 - .3(y_5 - y_{-3}) + .2(y_{-3} - y_{-5})$

3. Evaluate **4+3+3=10**

   $\int_{0.2}^{1.4}(sinx - \log_e x + e^x)dx$ using Trapezoidal rule, Simpson's 1/3 rd rule, Simpson's 3/8 th dividing the range of integration into 12 equal parts.

4. Use Picard's method to find the solution of $\frac{dy}{dx} = 1 + xy$ which passes through the point (0, 1) in the interval (0,0.5) such that the value of y is correct to three decimal places. Take h=0.1. **10**

5. Discuss Euler's method and Modified Euler's method. **5+5=10**

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

7. 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 **5+5=10**

   $x_0 = 0, y_0 = 1.$

8. Deduce Lagrange's Interpolation formula .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. **6+4=10**

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