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S.Y.B.Sc. (Regular)
MATHEMATICS
MT - 232 (A) : Numerical Methods and its Applications
(2019 Pattern) (Credit System) (Semester - III) (23112A) (Paper - II)

Time : 2 Hours]   *[Max. Marks : 35*

Instructions to the candidates:
  1) *All questions are compulsory.*
  2) *Figures to the right indicate full marks*

Q1) Attempt any FIVE of the following.   **[5]**

     a)   Evaluate $\Delta(a^{2x})$ take h = 1

     b)   Evaluate $\int_{0}^{1} x^2 dx$ by Trapezoidal rule take h = 0.5.

     c)   Write Runge - Kutta second order formula for $\dfrac{dy}{dx} = f(x, y), y(x_0) = y_0$.

     d)   Write the for $y_1^{(n+1)}$ in Modified Euler's method.

     e)   Define Absolute error.

     f)   Find the first approximation x_1 to the root of $x^3 - 18 = 0$ by Newton - Raphson method with $x_0 = 2.5$

     g)   Simplify $E^2(5x)$ take h=1 where E is shift operator.

Q2) a) Attempt any ONE of the following. [5]

    i) Write the rules for round - off the number to significant figure.

    ii) Explain Euler's method to solve $\frac{dy}{dx} = f(x, y)$ with $y(x_0) = y_0$

  b) Attempt any ONE of the following [5]

    i) Find $\sqrt[3]{13}$ by Newton - Raphson method (Two iterations) with $x_0 = 2.5$

    ii) Find log 3.7 using Lagrange's interpolation formula

x	3	3.5	4
$\log x$	1.09861	1.25277	1.3863

Q3) a) Attempt any ONE of the following [5]

    i) Explain Taylor's series method to solve initial value problem

    ii) Derive the formula for $\frac{dy}{dx}$ at $x = x_0$ in terms of Δ.

  b) Attempt any ONE of the following. [5]

    i) Find y when $x = 1$ by Runge -Kutta fourth order method given that

$$\frac{dy}{dx} = \frac{y-x}{y+x}, \; y(0) = 1, \; h = 1$$

    ii) Find the root of $xe^x - 2 = 0$ between 0.5 and 1 by Regula-Falsi method (Two iterations).

Q4) a) Attempt any ONE of the following. [5]

      i)   Explain bisection method to find approximate root of f (x) = 0.

      ii)   Derive Lagrange's interpolation formula.

  b) Attempt any ONE of the following. [5]

      i)   Evaluate $\int_{4}^{5.2} \log_e x \, dx$ by Simpson's $\dfrac{3}{8}$ rule with h = 0.2

      ii)   Find y (0.1) using Runge - Kutta second order method given that
$\dfrac{dy}{dx} = x+y$ with y (0) = 1, h = 0.1

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S.Y. B.Sc.

PHYSICS - I

PHY - 231 : Mathematical Methods in Physics

(2019 Pattern) (CBCS) (Semester - III) (Paper - I) (23121)

Time : 2 Hours]   *[Max. Marks : 35*

Instructions to the candidates:

    1)   *Question 1 is compulsory.*

    2)   *Solve any three questions from Q2 to Q5.*

    3)   *Questions 2 to 5 carry equal marks.*

    4)   *Figures to the right indicate full marks.*

    5)   *Use of calculator is allowed.*

Q1) Solve any five of the following :   **[5]**

    a)   If $z = x + iy$, then what is modulus of Z?

    b)   Define partial differentiation equation.

    c)   Find the total differential of the function, $F = f(x,y) = 2xy^2$.

    d)   State law of polygon of vectors.

    e)   If $\dfrac{d^2y}{dt^2} + w^2 y = F_0 \sin qt$ then write its degree and order.

    f)   State theorems of differentiation.

Q2) Answer the following :

    a)   i)   If $z = r(\cos\theta + i\sin\theta)$ is a polar form of a complex number, then obtain the exporiential form of a complex number.   **[3]**

        ii)   Find area of a triangle having vertices at P(1,3,2), Q(2, –1, 1), R(–1, 2, 3).   **[3]**

<div align="center">OR</div>

    a)   What is a scalar triple product and vector triple product. Show that the scalar triple product represents the volume of a parallelopiped.   **[6]**