Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, June 2021

Course : Statistics, Numerical Methods & Algorithms **Semester : II**
Program : BCA **Time : 03 Hour**
Course Code : MATH 1025 **Max. Marks: 100**

SECTION A

Attempt all questions. Each question carries 5 marks. This section contains multiple choice questions. For multiple choice question, only one option is correct.

S.No.		CO
Q1	Using Newton-Raphson method, the real root of $x\sin x + \cos x = 0$, which is near $x = \pi$ correct to three decimal places is: (A) 2.798 (B) 1.798 (C) 3.823 (D) 3.141	**CO1**
Q2	If $u = \frac{4xy^2}{z^3}$ and error in x, y, z be 0.001, the maximum relative error in u when $x = y = z = 1$ is: (A) 0.024 (B) 0.012 (C) 0.006 (D) 0.003	**CO1**
Q3	Given that $\frac{dy}{dx} = \log_e(x+y)$, with the initial condition that $y = 1$ when $x = 0$. The approximated solution at $x = 0.5$ using Euler's method when step size $h = 0.1$ is: (A) 1 (B) 2 (C) 3 (D) 4	**CO4**
Q4	In the forward difference table for the following data, <table><tr><td>x:</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr><tr><td>y:</td><td>9962</td><td>9848</td><td>9659</td><td>9397</td><td>9063</td><td>8660</td></tr></table>The value of $\Delta^2 y_{15}$ is: (A) -70 (B) -71 (C) -72 (D) -73	**CO2**
Q5	Given: $\frac{dy}{dx} = e^x - y^2$ with $y(0) = 1$. The approximate value of y when $x = 0.2$ correct upto 3 decimal places, using Taylor series method is: (A) 2.519 (B) 1.019 (C) 3.005 (D) 4.555	**CO4**
Q6	The value of $\int_0^1 \frac{1}{1+x}dx$ by Simpson's $1/3$ rule is: (A) 0.96315 (B) 0.63915 (C) 0.69315 (D) 0.69915	**CO3**

SECTION B

Attempt all questions. Each question carries 10 marks. Question 5 has internal choice.

Q1 Using Newton's backward interpolation formula, find the value of $e^{-1.9}$ from the following table of the value of e^{-x}. **CO2**

x	1	1.25	1.50	1.75	2
e^{-x}	0.3679	0.2865	0.2231	0.1738	0.1353

Q2 Given that: **CO4**

$$\frac{dy}{dx} = xy + y^2; \quad y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) = 1.5049.$$

Find the solution at $x = 0.4$, using Milne's method.

Q3 A slider in a machine moves along a fixed straight rod. Its distance x (in cm.) along the rod is given at various times t (in sec.). **CO3**

t:	0	0.1	0.2	0.3	0.4	0.5	0.6
x:	30.28	31.43	32.98	33.54	33.97	33.48	32.13

Evaluate $\frac{dx}{dt}$ at $t = 0.1$.

Q4 A real root of the equation $x^3 - 5x + 1 = 0$ lies in the interval $(0,1)$. Perform four iterations of the secant method. **CO1**

Q5 Given the values **CO2**

x:	5	7	11	13	17
$f(x)$:	150	392	1452	2366	5202

evaluate $f(9)$, using Newton's divided difference formula.

OR

Find the missing values in the table:

x:	45	50	55	60	65
y:	3	$-$	2	$-$	-2.4

SECTION C

Question of this section carries 20 marks and it has internal choice.

Q1 Solve the system of linear equations **CO4**

$$20x + y - 2z = 17; \; 3x + 20y - z = -18; \; 2x - 3y + 20z = 25.$$

Using

a) Jacobi's iteration method,

b) Gauss-Seidel iteration method.

OR

Use Runge-Kutta method of fourth order to find the numerical solution at $x = 1.4$ for

$$\frac{dy}{dx} = x^2 + y^2, y(1) = 0.$$

Assume step size $h = 0.2$.