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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination (Online), Jan.-Feb. 2021

Course: Engineering Mathematics **Semester: I**
Course Code: MATH 1036 **Time: 03 hrs.**
Programme: B.Tech. (All SoCS Batches) **Max. Marks: 100**

SECTION - A **6 X 5 = 30 Marks**

1. Each Question will carry 5 Marks
2. Instruction: Select the correct option(s)

Q 1	Given the system of linear equations $x - 4y + 5z = -1$, $2x - y + 3z = 1$, $3x + 2y + z = 3$ has: A. Unique solution B. No Solution C. Infinitely many solutions D. None of these	CO1
Q 2	If $y_n(x) = p^n[1 + (-1)^n sin2px]^{1/2}$, then the value of $y_8(0)$ when $p = 1/4$ is: A. $\left(\frac{1}{4}\right)^{1/8}$ B. $\left(\frac{1}{4}\right)^{1/4}$ C. $\left(\frac{1}{4}\right)^{8}$ D. $\left(\frac{1}{4}\right)^{4}$	CO2
Q 3	Find the particular integral of $(D^2 + 5D + 6)y = e^x$: A. $\frac{e^x}{12}$ B. $\frac{e^x}{6}$ C. $\frac{e^x}{24}$ D. $\frac{e^x}{30}$	CO3
Q 4	A number x is chosen at random from the numbers -2, -1, 0, 1, 2. Then the probability that $x^2 < 2$ is? A. 1/5 B. 2/5 C. 3/5 D. 4/5	CO4
Q 5	Using Newton-Raphson method, find the real root of $xsinx + cosx = 0$ which is near $x = \pi$ correct to three decimal places: A. 2.798 B. 1.798 C. 3.823 D. 3.141	CO5
Q 6	The value of $\int_0^1 \frac{dx}{1+x}$ by Simpson's 1/3 rule is: A. 0.96315 B. 0.63915 C. 0.69315 D. 0.69915	CO5

SECTION – B **10 X 5 = 50 Marks**

1. Each question will carry 10 marks
2. Instruction: Answer on a separate white sheet, upload the solution as image.

Q 1	Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence compute A^{-1}.	CO1
Q 2	Change the order of integration and hence evaluate $\int_0^a \int_{\sqrt{ax}}^{a} \frac{y^2 dxdy}{\sqrt{y^4 - a^2x^2}}$.	CO2

Q 3	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.). 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 $t = 0.1$.	CO5
Q 4	Assume that the probability of an individual coalminer being killed in a mine accident during a year is 1/2400. Use Poisson's distribution to calculate the probability that in a mine employing 200 miners there will be at least one fatal accident in a year.	CO4
Q 5	Solve, by the method of variation of parameters, $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$. **OR** Solve $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$ given that $y = x$ is a solution.	CO3

Section – C **1 X 20 = 20 Marks**

1. Each Question carries 20 Marks.
2. Instruction: Answer on a separate white sheet, upload the solution as image.

Q 1	Solve the system of linear equations $20x + y - 2z = 17;\quad 3x + 20y - z = -18;\quad 2x - 3y + 20z = 25$. 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 $h = 0.2$.	CO5