Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Engineering Mathematics **Semester: I**
Program: B.Tech. SoCS (All Batches) **Time: 03 hrs.**
Course Code: MATH 1052 **Max. Marks: 100**

Instructions: Read all the below mentioned instructions carefully and follow them strictly:

1) Mention Enrolment No. at the top of the question paper.
2) Attempt all the parts of a question at one place only.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Examine the following vectors for linear dependence and find the relation if it exists. $X_1 = (1,1,-1,1), X_2 = (1,-1,2,-1), X_3 = (3,1,0,1)$.	**4**	**CO1**
Q 2	If $y = e^{ax} sinbx$, prove that $y_2 - 2ay_1 + (a^2 + b^2)y = 0$.	**4**	**CO2**
Q 3	Solve $(D-1)^2 y = (e^{2x}x + sin2x)$.	**4**	**CO3**
Q 4	In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10, use Poisson distribution to calculate its mean.	**4**	**CO4**
Q 5	Obtain $\sqrt{12}$, to five places of decimals by Newton Raphson method.	**4**	**CO5**

SECTION B
(4Qx10M= 40 Marks)

Q 6	If $y = x^n logx$, prove that $y_{n+1} = {}^{n!}/_{x}$.	**10**	**CO2**
Q 7	Solve, by the method of variation of parameters, $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x logx$.	**10**	**CO3**
Q 8	In a certain distribution, the first four moments about a point are -1.5, 17,-30 and 108. Calculate β_1, β_2 and state whether the distribution is leptokurtic or platykurtic.	**10**	**CO4**

Q9	The values of x and y are given as below x : 5 6 9 11 y : 12 13 14 16 Using Newton's forward interpolation formula, find y at $x = 7$. **OR** Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 and 3/8 rule (choose $h = 1/6$). Hence obtain the approximate value of π.	**10**	**CO5**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	**a)** Change the order of integration and hence evaluate $\int_0^a \int_y^a \frac{x\,dxdy}{x^2+y^2}$. **b)** Evaluate $\iint_R x^2\,dxdy$, where R is the region in the first quadrant bounded by the lines $x = y, y = 0, x = 8$ and the curve $xy = 16$. **OR** **c)** Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates. **d)** Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\,dx\,dy\,dz$.	**20**	**CO2**
Q 11	Use Runge – Kutta method of fourth order to find the numerical solution at $x = 0.4$ for $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$. Assume step size $h = 0.2$.	**20**	**CO5**