Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Course: Mathematics II — **Semester: II**
Course Code: MATH 1005 — **Time: 03 hrs.**
Programme: B.Tech. (All SoCS Branches) — **Max. Marks: 40**
Instructions: Attempt all questions**.** All questions carry equal marks.

S. No.	PART B	Marks	CO
Q2 (A)	Determine the solution of $\left(1+e^{\frac{x}{y}}\right)dx+\left(1-\frac{x}{y}\right)e^{\frac{x}{y}}dy=0.$	**4**	**CO1**
Q2 (B)	If $y=e^{x^2}$ is a solution of the differential equation $y''-4xy'+(4x^2-3)y=0$, then determine a second independent solution.	**4**	**CO1**
Q3 (A)	Out of 320 families with 5 children each, what percentage would be expected to have (***i***) 2 boys and 3 girls, and (***ii***) at least one boy? Assuming equal probability for boys and girls.	**4**	**CO2**
Q3 (B)	Perform two iterations to determine the real root of $\cos x-3x+1=0$ by Bisection method in the interval [0.60, 0.61].	**4**	**CO3**
Q4 (A)	If δ and μ denote the central and average difference operators respectively, then prove the relation $1+\delta^2\mu^2\cong\left(1+\frac{\delta^2}{2}\right)^2$.	**4**	**CO3**
Q4 (B)	Perform two iteration to solve the system of linear equations $2x+y-z=4,\ x-y+2z=-2,\ -x+2y-z=2$ by Gauss Seidel's method correct up to three places of decimal with the initial guess $x=0.75, y=0.75$ and $z=-0.75$.	**4**	**CO3**
Q5 (A)	The value of the integral $\int_1^9 x^2dx$ by Trapezoidal rule is $2\left[\frac{1}{2}(1+9^2)+\alpha^2+\beta^2+7^2\right]$ for $n=4$. Determine the value of α and β.	**4**	**CO3**
Q5 (B)	Using Runge-Kutta fourth order method, evaluate $y(0.1)$ of the differential equation $\frac{dy}{dx}=x+y^2$, with $y(0)=1$, taking h = 0.1.	**4**	**CO3**
Q6	Draw the Hasse diagram for the poset $P=(\{2,4,6,9,12,18,27,36,48,60,72\},\vert)$, where "a | b " means " a divides b". Answer the following questions: (***i***) Find the maximal elements. (***ii***) Find the minimal elements. (***iii***) Find the greatest lower bound of {2, 9}, if it exists. (***iv***) Find the least upper bound of {2, 9}, if it exists.	**8**	**CO4**