Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Advanced Mathematics **Semester: I**
Course Code: MATH 7002 **Time: 03 hrs.**
Programme: M.Tech (ROE) **Max. Marks: 100**

Instructions: Attempt all questions from **Section A** (each carrying 4 marks); all questions from **Section B** (each carrying 10 marks) and all questions from **Section C** (carrying 20 marks).

SECTION A

S. No.		Marks	CO
Q1	Determine the value of $\Delta^{10}(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)$.	4	CO1
Q2	Evaluate $\int_0^{1.5} \frac{1}{1+x^3}dx$ using Simpson's 3/8 method, taking h = 0.25.	4	CO1
Q3	Determine the value of y at $x=0.2$ for the differential equation $\frac{dy}{dx}=y+x^2,\ y(0)=1$ by Euler's method with step size 0.1.	4	CO3
Q4	The regression lines of y on x and x on y are respectively $y=ax+b,\ x=cy+d$. Show that $\frac{\sigma_y}{\sigma_x}=\sqrt{\frac{a}{c}}$.	4	CO5
Q5	Classify the following partial differential equations $(i)\ 2u_{xx}+u_{xy}+4u_{yy}+u_x=0$ $(ii)\ 3u_{xx}-6u_{xy}+2u_{yy}-7u_y=0.$	4	CO4

SECTION B

Q6	Determine a real root of $f(x)=x\sin x+\cos x=0$ which is near $x=\pi$ correct to three decimal places by using Newton-Raphson's method.	10	CO1
Q7	From the table of half-yearly premium for policies maturing at different ages, estimate the premium for a policy maturing at the age of 63: Age: 45 50 55 60 65 Premium: 114.84 96.16 83.32 74.48 68.48. (in dollars)	10	CO1
Q8	Fit a curve of the form $y=ae^{bx}$ by the method of least square to the data x: 1 5 7 9 12 y: 10 15 12 15 21.	10	CO5
Q9	Solve the differential equation $\frac{dy}{dx}=\log(x+y),\ y(0)=2$ by Euler's modified method at $x=1.2$ and 1.4 with $h=0.2$.	10	CO3
	OR		

Q9	Determine the values y of at the pivotal points of the interval $(0,1)$ if y satisfies the boundary value problem $y^{iv}+81y=81x^2,\ y(0)=y(1)=y''(0)=y''(1)=0$. (Take n=3)	**10**	**CO3**
SECTION-C			
Q10 (A)	Solve the system of equations by Crout'smethod $3x+2y+7z=4$, $2x+3y+z=5$, $3x+4y+z=7$.	**10**	**CO2**
Q10 (B)	Determine the moment generating function, first four moments about mean and coefficient of skewness and kurtosis for Binomial distribution.	**10**	**CO5**
Q11	Solve the equation $u_{xx}+u_{yy}=-10\left(x^2+y^2+10\right)$, over the square mesh with sides $x=0, y=0, x=3, y=3$ with $u=0$ on the boundary for fifth iteration only with $h=k=1$ by Liebmann's method.	**20**	**CO4**
	OR		
Q11 (A)	Solve the equation $u_{tt}=4u_{xx}$, with $u(0,t)=0,\ u(4,t)=0,\ u_t(x,0)=0$ and $u(x,0)=x(4-x)$ by finite difference method taking $h=1$.	**10**	**CO4**
Q11 (B)	Solve the equation $u_t=u_{xx}, 0\le x\le 1, t\ge 0$, with $u(0,t)=0;\ u(1,t)=0$ and $u(x,0)=\begin{cases} 2x & for\ 0\le x\le \frac{1}{2} \\ 2(1-x) & for\ \frac{1}{2}\le x\le 1 \end{cases}$ by using Bender-Schmidt's method.	**10**	**CO4**