Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

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

Course: Numerical Methods — **Semester:** V
Program: B.Sc. (Hons.) Mathematics — **Time :** 03 hrs.
Course Code: MATH 3021 — **Max. Marks:** 100
Instructions: All questions are compulsory. Scientific calculator is allowed.

SECTION A

S. No.		Marks	CO
Q1	The smallest positive root of $x^3 - 5x + 3 = 0$ by Newton Raphson Method. A. 0.65678 B. 6.5678 C. 0.56768 D. 5.6768	5	CO1
Q2	Real positive root of equations by Bisection Method correct upto 3 decimal Places for the équation $x^3 - 4x + 9 = 0$ is A. 2.594 B. 3.923 C. 2.706 D. 3.796	5	CO1
Q3	The missing terms in the given tables are … X: 45, 50, 55, 60, 65 Y: 3.0, ---, 2.0, ---, -2.4 A. 2.825, 0.325 B. 2.5, 0.2 C. 2.654, 0.62 D. 2.925, 0.225	5	CO2
Q4	Evaluate $\Delta^{10}[(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)$ A. $abcd$ B. $abcd\ (24)$ C. $abcd\ (10!)$ D. $(abcd)^{10}$	5	CO2
Q5	By Trapezoidal rule $\int_0^6 \frac{1}{1+x^2}dx$ using 6 intervals is E. 1.4108 F. 1.1408 G. 1.4308 H. 1.3408	5	CO3
Q6	Using Euler's method considering step-length $h = 0.1$, given that $\frac{dy}{dx} = x + y,$ with initial condition $y(0) = 1.0,\ y(0.2)$ is	5	CO5

	A. 1.10 B. 1.11 *C.* 1.22 *D.* 1.20		
	SECTION B		
Q7	Differentiate between round off error and truncation error with help of example. The diameter and altitude of a can in the shape of a right circular cylinder are measured 4cm and 6cm respectively. The possible error in each measurement is 0.1cm. Find approximately the maximum possible error in computation of its volume.	10	CO1
Q8	Using Newton Divided Difference formula find the polynomial $f(x)$ with the help of following table and evaluate $f(1)$ x: -4, -1, 0, 2, 5 $f(x)$: 1245, 33, 5, 9, 1335	10	CO2
Q9	Solve the following using Gauss Elimination Method. $2x_1 + 20x_2 - 2x_3 = -44$ $10x_1 + 2x_2 + x_3 = 9$ $-2x_1 + 3x_2 + 10x_3 = 22.$	10	CO4
Q10	A solid of revolution is formed by rotating about the X-axis, the area between the x-axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates: x: 0.00, 0.25, 0.50, 0.75, 1.00 y: 1.0000, 0.9896, 0.9589, 0.9089, 0.8415 Estimate the volume of the solid formed using Simpson's rule.	10	CO3
Q11	Use fourth order Runge-Kutta method to solve for $y(1.2)$, considering step-length $h = 0.1$, given that $\frac{dy}{dx} = x^2 + y^2,$ with initial condition $y(1) = 1.5$. OR Use Modified Euler's method to solve for $y(0.4)$, considering step-length $h = 0.2$, given that $\frac{dy}{dx} = 1 + y^2,$ with initial condition $y(0) = 0$.	10	CO5
	SECTION-C		
Q 12	Evaluate $\int_1^2 \int_2^3 e^{x+y} dxdy$ using composite 1/3 Simpson Rule and compare with exact solution. OR A slider in a machine moves along a fixed straight rod. Its distance x cm along the rod is given below for various values of the time t. Find the velocity and acceleration of the slider when i): = 0.1 second ii) t = 0.6 second. t: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 x: 30.13, 31.62, 32.87, 33.64, 33.95, 33.81, 33.24	20	CO3