Name: **Enrolment No:**	

UPES

End Semester Examination, May 2023

Course: Introduction to MATLAB programming **Semester: IV**

Program: B.Sc. Physics **Time : 03 hrs.**

Course Code: MATH 2034K **Max. Marks: 100**

Instructions: Attempt all the questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Describe *who* and *whos* commands with examples.	**4**	**CO1**
Q 2	Describe *continue* statement using an example.	**4**	**CO2**
Q 3	Write a program using symbolic math to carry out the multiplication of the following polynomial. $(x+3)(x-4)x(x+8)(x-1)$.	**4**	**CO2**
Q 4	Write a program to define and plot a two variable function in 3- dimensions.	**4**	**CO3**
Q 5	Explain how to create symbolic numbers with variable precision.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Outline the use of *colon* operator.	**10**	**CO1**
Q 7	The position of a moving particle as a function of time is given by: $x = (4 - 0.1t)\sin(0.8t)$, $y = (4 - 0.1t)\cos(0.8t)$ and $z = 0.4t^{\frac{3}{2}}$ Write a program to plot the position of the particle for $0 \leq t \leq 30$.	**10**	**CO3**
Q 8	Write a program to find following indefinite integrals using symbolic functions: (a) $\int \frac{x^3}{\sqrt{1-x^2}}dx$ (b) $\int x^2 \cos x \, dx$	**10**	**CO4**
Q 9	Write ten logical and relational operators used in MATLAB. **OR** Write two codes explaining two kinds of loops used in MATLAB.	**10**	**CO2**

<table>
<tr><th colspan="4">SECTION-C
(2Qx20M=40 Marks)</th></tr>
<tr><td>Q 10</td><td>Write a program to find the solution of the following differential equation using symbolic math that satisfies the given initial conditions. In the program also include scripts to plot the solution for $0 \leq t \leq 7$.
$\frac{d^2y}{dt^2} - 0.08\frac{dy}{dt} + 0.6y = 0,\ y(0) = 2, y'(0) = 3.$
In the program, further include scripts to verify the solution using analytical methods.</td><td>20</td><td>CO4</td></tr>
<tr><td>Q 11</td><td>Explain how to use polyfit command for curve fitting. Generate 100 points near the curve $y = 3 + 4x - 2x^2$. Use polyfit to fit a second order polynomial over the generated data. Will the coefficients of the fitted curve will be $3, 4, -2$, explain. How to estimate the proper order of polynomial given any set of random points generated from a polynomial not known in advance?
OR
The boiling temperature of water T_B at various altitudes h is given in the following table.
<table>
<tr><td>$h\ (ft)$</td><td>0</td><td>2000</td><td>5000</td><td>7500</td><td>10000</td><td>20000</td><td>26000</td></tr>
<tr><td>T(°F)</td><td>212</td><td>210</td><td>203</td><td>198</td><td>194</td><td>178</td><td>168</td></tr>
</table>
Write a program to determine the following. (a) a linear equation in the form $T_B = mh + b$ that best fits the data. (b) An estimate of the fitting error. (c) Use the equation to calculate the boiling temperature at 16000 ft. (d) Make a plot of the points and the equation. How will the fit change if we use exponential function to fit the data?</td><td>20</td><td>CO2</td></tr>
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