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CS2820 - Calculus for CS  
B.Tech. CSE 4<sup>th</sup> Semester  
**Mid Term**

Date: 11 March, 2024 (Mon) **FN**

Marks: 20

Time: 1.5hr

**Instructions**

Each question is for 4 marks. Answer 5 questions for a total of **20 Marks** based on the choices given for each question. Any attempts above 20 marks will not be considered.

Q. No.	Question	Marks	CO	Blooms Level
1*	<p>The motion of a harmonic oscillator which can be thought of as a mass suspended by a spring is given by</p> $y(t) = \frac{1}{2} \cos(12t) + \frac{1}{4} \sin(12t)$ <p>where <math>y(t)</math> is in meters and <math>t</math> in seconds.</p> <p>a). What is the velocity of the mass at <math>t = \pi/6</math> sec?</p> <p>b). What is the position of the mass when the velocity is maximum?</p>	2+2	CO1, CO2	Ap
2*	<p>Expand <math>\frac{1}{\sqrt{x}}</math> about <math>x = 1</math> upto the 4<sup>th</sup> degree term of the Taylor series.</p>	4	CO3	Ap
3**	<p>A cylindrical water tank of radius 1 m and height 4 m that was initially filled completely has a leak at the bottom from which water is flowing out. If the rate of outflow is proportional to the height of the water level in the tank, find the relationship of the water level in the tank as function of time?</p>	4	CO4	Ap

Q. No.	Question	Marks	CO	Blooms Level
4**	<p>Find the area under the curve <math>y = \sin^{-1} x</math> between the lines <math>x = -1</math> and <math>x = 1</math>.</p> <p style="text-align: center;"><b>OR</b></p> <p>Find the area enclosed by the curves <math>y = 9 - 3x^2</math> and <math>y = x^2</math> using either single or double integral.</p>	4	CO4	Ap
5*	<p>Approximate the value of <math>y = x - \cos x</math> at <math>x = 3</math> by linearizing the function about <math>x = \pi</math>.</p> <p style="text-align: center;"><b>OR</b></p> <p>Find a linear approximation of <math>y</math> in terms of <math>x</math>, near <math>x = 0</math> if <math>1 + y = 2x + \sin(xy)</math>.</p>	4	CO3	Ap

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END