Reg. No: Name:

Course: MAT3011 (Calculus for Engineers)

Slot: G1& TG1

Max. Marks: 10 **Class No:** VL2020210505038

Due Date: 20.03.2021

Signature:_____

Answer all the questions

Guidelines to be Followed:

1. Download this PDF file and write the answers with corresponding question numbers.
2. The Answers should follow the next page onwards
3. First solve these problems on a rough sheet and then write the answers in detail in the specified space neatly without any corrections.
4. Fill the details with your name reg. no. and your signature.
5. Take clear and visible snapshot of your filled-in answer sheet carefully and make a SINGLE PDF FILE ONLY and then UPLOAD it through log-in portal (VTOP).
6. Uploading of answers in any other format is not acceptable. Do not send different image files or zipped files. Do not send the answer sheet to my e- mail address.
7. The uploaded file will not be accepted after the due date, and the marks awarded will be automatically zero for those who do not submit in time. Do not postpone your task until the last date of submission.
8. Follow the guidelines strictly. Any deviation from the above instructions will lead to the reduction in marks.

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1. Verify mean value theorem for the function $f(x) = 2x^2 - 3x + 1, \quad x \in [0,2]$.

2. Given $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$, find where the function f is increasing and decreasing. Also provide the local maximum and minimum values.

3. Sketch the graph of a function $f(x) = 1 - 9x - 6x^2 - x^3$ by hand and include the coordinates of any local and absolute extreme points and inflection points.

4. A cup-like object is made by rotating the area between $y = 2x^2$ and $y = x + 1$ with $x \geq 0$ around the x-axis. Find the volume of the material needed to make the cup. Units are **cm**.

5. Find the volume of the solid generated by revolving the regions bounded by the lines and the curves $y = x^2 + 1, \quad y = x + 3$ about the $x-$axis.

6. Find the following ($\mathbb{L}$ is a Laplace operator).

   a. $\mathbb{L}[e^{2t}t^2]$

   b. $\mathbb{L}[e^{2t}cos2t]$

   c. $\mathbb{L}^{-1}\left[\frac{e^{2s}}{s^2}\right]$

7. Graph the function $f(t) = 3[h(t-1) - h(t-4)]$ for $t \geq 0$ and $h(t)$ is a heaviside function. Also find the $\mathbb{L}[f(t)]$.

8. Use the partial decomposition method to find

   a. $\mathbb{L}^{-1}\left[\frac{12}{(s-3)(s+1)}\right]$

   b. $\mathbb{L}^{-1}\left[\frac{24e^{-5s}}{s^2-9}\right]$

9. Graph the function $f(t) = t[h(t-1) - h(t-3)]$ for $t \geq 0$, where $h(t)$ is the Heaviside step function, and find $\mathbb{L}[f(t)]$.

10. Use convolution theorem to find the following:

    a. $\mathbb{L}^{-1}\left\{\frac{1}{(s^2+4)(s-1)}\right\}$

    b. $\mathbb{L}^{-1}\left\{\frac{1}{s^2(s+6)}\right\}$

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