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(Deemed to be University under section 3 of UGC Act, 1956)

A

School of Advanced Sciences
Department of Mathematics
Fall Semester 2020-2021
MAT–1011: Calculus for Engineers (MATLAB)

Date: xx.01.2021 **FINAL ASSESSMENT TEST** **SLOT: LXX+LXX**

1. Demonstrate Rolle's theorem for the function $f(x) = x^5 - 5x^3 + 4x$ in the interval $(-3, 3)$. Plot the graph of the function $f(x)$ and show the points inside the interval $(-3, 3)$ which obey the Rolle's theorem. [20]

2. (a) Find the Laplace transform of the function $f(t) = \begin{cases} \sin t & ; 0 \le t \le \pi \\ 0 & ; \pi \le t \le 2\pi \end{cases}$ [10]

   (b) Find the Inverse Laplace transformation of the function $\dfrac{4s+5}{(s-1)^2(s+2)}$ [10]

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B

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Date: xx.01.2021 **FINAL ASSESSMENT TEST** **SLOT: LXX+LXX**

1. (a) Find the critical values of the function $f(x) = x^3 - 6x^2 + 9x + 2$. [8]

   (b) Find the values of the second derivative of $f(x)$ and check the sign of the $f''(x)$ at the critical points and sketch the graph of the function $f(x)$ with necessary formatting. [12]

2. Find the value of integral $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}}\, dy\, dx$. Using 'surf', visualize the surface $f(x,y) = \frac{x}{\sqrt{x^2+y^2}}$. [20]

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C

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Date: xx.01.2021 **FINAL ASSESSMENT TEST** **SLOT: LXX+LXX**

1. Find the Taylor series expansion of the function $f(x,y) = tan^{-1}(y/x)$ upto the terms of 3rd degree at the point $(1,1)$. [20]
   Plot the graph of the function $f(x,y)$ using *surf* in the neighbourhood of the given point. Include the necessary information such as title, axis etc. in the graph.
2. Find the work done by the force field $\overline{f} = x\hat{i} + y\hat{j} + z\hat{k}$ in moving a particle along the curve C given in its parametric form as $x = \cos \pi t$, $y = t^2$ and $z = \sin \pi t$ from $t = 0$ to $t = 1$. [20]
   Check whether the force field is conservative.

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D

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Date: xx.01.2021 **FINAL ASSESSMENT TEST** **SLOT: LXX+LXX**

1. Evaluate the area bounded by the two curves $y = x^2$ and $y = 2x$ using MATLAB. [20]
   Sketch the curves which indicate the required area.
2. Find the gradient of the scalar function $f(x,y) = \sqrt{x^2 + y^2}$. [20]
   Plot the vector field of the gradient and also show the scalar function using countour curves.

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