FS 2018-19

VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

DEPARTMENT OF MATHEMATICS
SCHOOL OF ADVANCED SCIENCES
Continuous Assessment Test I

Course Code: MAT1011
Course Name: Calculus for Engineers
Max. Marks: 50

Slot: G2+TG2
Date: 19.08.2018
Duration: 90 Minutes

Answer ALL the Questions

1. (a) Verify Rolle's theorem for the function $f(x) = \log\left\{\frac{x^2+ab}{x(a+b)}\right\}$ on $[a, b]$, where $a > 0$. [5]

   (b) Determine the critical points, points of local maxima and local minima of $\frac{9x^{1/3}}{14}(x^2 - 7)$, and then identify the intervals on which f is concave up and concave down. Also find the points of inflection of f. [5]

2. (a) Determine the area of the region enclosed by $y = x^2$ and $y = \sqrt{x}$. [5]

   (b) The curve $y = x^2 + 4$ is rotated one revolution about the x-axis between the limits $x = 1$ and $x = 4$. Determine the volume of the solid of revolution produced. [5]

3. (a) Find the Laplace transform of the function $te^t \cos^2 t$. [5]

   (b) Evaluate $\mathcal{L}^{-1}\left(\frac{e^{-5s}}{s^2-4s-5}\right)$. [5]

4. (a) Find the Laplace transform of $u(t-4)\sin 2t$, where $u(t-4)$ is the unit step function. [5]

   (b) Find the Laplace transform of the following periodic function: [5]

$$f(t) = \begin{cases} t & \text{for } 0 < t < \pi \\ \pi - t & \text{for } \pi < t < 2\pi. \end{cases}$$

5. (a) Use partial fraction method to find $\mathcal{L}^{-1}\left(\frac{4s+5}{(s-1)(s+2)}\right)$. [5]

(b) Use convolution theorem to find the inverse Laplace transform of the function $F(s) = \frac{s}{(s^2+16)^2}$. [5]
