Digital Assignment I

Module I & II

Submission Date: - 11-12-2020

1) The height of an object moving vertically is given by $s = -16t^2 + 64t + 160$ with s in feet and t in second. Find,
   (a) its velocity when $t = 0$.
   (b) its maximum height.
   (c) when does it hit the ground?
   (d) with what speed does it hit the ground?

2) Determine the constants ‘a’ and ‘b’ in order that function $f(x) = x^3 + ax^2 + bx + c$ a relative minima at $x = 4$ and a point of inflection at $x = 1$.

3) A line passing through the point $(1, 2)$ intersects the $X - axis$ at $A(a, 0)$ and $Y - axis$ at$B(0, b)$. Find area of triangle of least area if ‘a’ and ‘b’ are positive.

4) Determine the absolute extrema of the $f(x) = 8x^3 + 81x^2 - 42x - 8$ on the$[-8, 2]$.

5) Give the intervals where the given functions are increasing and decreasing
   (i) $f(x) = 3x + 3$
   (ii) $h(t) = t^2 + 2t - 3$

6) Find the point at the curves $f(x)$ where tangent is parallel to the cord joining end points of curves.
   (i) $f(x) = x^2 + 2x - 1$ on $[0, 1]$
   (ii) $f(x) = \sqrt{x - 1}$ on $[1, 3]$

7) Find the area bounded on the right by $x + y = 2$, on the left by $y = x^2$ and below by the X axis.

8) Find the volume of the solid generated by revolving the region bounded by the curve $y = x^3$, the y-axis, and the line $y = 3$ about the y-axis.

9) Using method of washers, find the volume of the semi-circular region bounded by the curve $x = \sqrt{4 - y^2}$ and the y-axis that is revolved about the line $x = -1$.

10) Evaluate the integrals
   (i) $\int_0^1 \frac{dx}{\sqrt{(1+x^4)}}$
   (ii) $\int_0^{\frac{\pi}{2}} \sqrt{tan\theta}\ d\theta$

11) Find $L^{-1}\left[\frac{5s+4}{s^2} - \frac{2s-18}{s^2+9} + \frac{24-30\sqrt{s}}{s^4}\right]$

12) Evaluate (a) $\int_0^\infty te^{-2t}cost\ dt$ (b) $\int_0^\infty \frac{e^{-t}-e^{-3t}}{t}\ dt$

13) Find the Laplace transform of

(i) $\frac{cosat-cosbt}{t}$ (ii) $t^2e^{-t}cost$

14) Find the Laplace transform of $f(t) = \begin{cases} 1, & 0 < t < \frac{a}{2} \\ -1, & \frac{a}{2} < t < a \end{cases}$ with $f(t+a) = f(t)$

15) Using convolution theorem find (i) $L^{-1}\left[\frac{s}{(s^2+4)(s^2+9)}\right]$ (ii) $L^{-1}\left[\frac{s^2}{(s^2+4)(s^2+1)}\right]$