Numerical Methods for Engineers
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Assignment – 2
(Answer any 3 of the following)

1. A civil engineer is assigned the task of calculating the amount of earth to be moved to fill a depression in the land. He uses the method of sweeping to measure the shallow volume of the pit. Initially he fixes the center of the pit approximately, and then with respect to this point he sweeps a thread to determine the approximate radius "r" of the pit at different horizontal cross sections of heights 'h' from the bottom. The readings are as shown below. Determine the volume of the earth to be moved to fill the pit

h(m):	0	0.50	1.0	1.5	2.0	2.5	3.0
r(m):	0	0.75	2.0	3.75	6.0	8.5	11.0

[Hint: Total vol. Of the pit = $\int_{h=0}^{3} \pi r^2 dh$]

2. A reservoir discharging through sluices at depth 'h' below the water surface has a surface area 'A' for various values of 'h' as given below. If 't' is time in minimum and the rate of fall of surface is given by $\frac{dh}{dt} = \frac{-48}{A}\sqrt{h}$. Estimate the time taken for the water to fall from 14m to 10m above sluices

h(m):	10	11	12	13	14
A(Sq. m):	950	1070	1200	1350	1530.

[Hint: Total time taken=T= $\int_{14}^{10} dt = \frac{1}{48}\int_{10}^{14} \frac{A}{\sqrt{h}} dh$]

3. The velocity of a vehicle moving in a straight road is recorded at definite intervals as shown below. Determine the total distance traveled by the vehicle in the above mentioned period

t(sec):	100	200	300	400	500	600	700
V(KMPH):	62	66	68	68	71	68	66

4. Obtain the integral I= $\int_{0}^{\pi/4} e^{3x} Cos2x dx$ choosing suitable number of intervals, by applying (i) Trapezoidal (ii) Simpson's 1/3 rd rule and (iii) Simpson's 3/8 th rule.
[Soln: 1.383828, 1.392371, 1.3923102 (with 12 intervals)].

5. A solid of revolution is formed by rotating about the x-axis the area between the x-axis, the lines x=0 and x=1, and a curve through the points with the following coordinates:

x:	0.0	0.25	0.50	0.75	1.00
y:	1.0	0.9896	0.9589	0.9089	0.8415.

Estimate the volume of the solid formed, giving the answer to three decimal places.
[Soln:2.8192]