

Hydraulics

Question 1

Find out the missing storm precipitation of station 'C' given in the following table:

Station	A	B	C	D	E
Storm precipitation (cm)	9.7	8.3	---	11.7	8.0
Normal Annual precipitation (cm)	100.3	109.5	93.5	125.7	117.5

Solution:

$$10\% \text{ of } N_c = 93.5 \times 10/100 = 9.35$$

$\pm 10\%$ Range of $N_c = 84.15$ to 102.85 (Values of N_b , N_d and N_e are out of this range, hence normal mean method applicable) **Station**

$$P_c = (1/4) (9.7 \times 93.5/100.3 + 8.3 \times 93.5/109.5 + 11.7 \times 93.5/125.7 + 8.0 \times 93.5/117.5) \\ = \mathbf{7.8 \text{ cm.}}$$

Fluid Mechanics

Question 2

Water at 20°C flow with average velocity of 2cm/s inside a circular pipe. Determine flow type if the pipe diameter, a) 2 cm , b) 15 cm , and c) 30 cm

Take $\mu = 1.002 \times 10^{-3} \text{ kg/m.s}$

$\rho = 998 \text{ kg/m}^3$

Solution:

- a) Laminar Flow
- b) Transition Flow
- c) Turbulent Flow

Strength of Materials

Question 3

The following perpendicular offsets were taken at 10m intervals from a survey line to an irregular boundary line:-
 $3.82, 4.37, 6.82, 5.26, 7.59, 8.90, 9.52, 8.42,$ and 6.43m .

Calculate the Area Enclosed between the Survey line and Boundary?

= **560.05 sq.meters**

CPM

Question 4

Let's suppose that for a specific project following are values of 3 elements of earned value management

- Planned Value = Rs. 55, 000/-
- Earned Value = Rs. 49,000/-
- Actual Cost = Rs. 56,000/-
- BAC = Rs. 230,000/-
- Completion Time = 12 months

Find, SV, % SV, CV, % CV, SPI, CPI, CSI, VAC, EACt, EAC, ETC and also elaborate what these values mean to project manager?

Solution:

$$\text{Schedule Variance} = \text{EV-PV}$$

$$49,000$$

$$- \underline{55,000}$$

$$\text{SV} = -6,000$$

$$\% \text{SV} = \text{SV/PV} = -6000/55000$$

$$\underline{= -11\%}$$

$$\text{Cost Variance} = \text{EV-AC}$$

$$49,000$$

$$\underline{56,000}$$

$$\underline{\text{CV} = -7,000}$$

$$\% \text{CV} = \text{CV/EV} = -7000/49000$$

$$\underline{= -14\%}$$

SPI: EV/PV

$$49,000/55,000 = \mathbf{0.891}$$

CPI: EV/AC

$$49,000/56000 = \mathbf{0.875}$$

CSI: SPI x CPI

$$.891 \times .875 = \mathbf{0.780}$$

EACt: (BAC/SPI) / (BAC/months)

$$(230,000 / .891) / (230,000/12) = \mathbf{13.47 \text{ months EAC:}}$$

BAC / CPI

$$230,000/0.875 = \mathbf{Rs. 262,857/-}$$

ETC: (BAC - EV) / CPI

$$(230,000 - 49,000) / 0.891 = \mathbf{Rs. 203, 143/-VAC}$$

= BAC - EAC

$$230,000 - 262,857 = \mathbf{-32,857}$$

Question 5

Calculate Early start(ES),Early Finish(EF),Late start(LS),late Finish(LF) AND Total Float(TF)for following activities?

Activity	Duration	IPA
A	5	-
B	8	A
C	6	A
D	9	B
E	6	B,C

F	3	C
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G	1	D,E,F
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Solution:

Activity	Duration	ES	E F	LS	LF	T F
A	5	0	5	0	5	0
B	8	5	13	5	13	0
C	6	5	11	10	16	5
D	9	13	22	13	22	0
E	6	13	19	16	22	3
F	3	11	14	19	22	8
G	1	22	23	22	23	0

Quantity Surveying and Estimation

Question 6

A water tank has an internal square base of 4 ft 6” and height of 1.5 m. Estimate the following:-

- a. Base Area of tank in sq. yds.
- b. Max capacity of the tank in liters.

Solution:

$$\text{Area} = [(4.5/3.281)^2] = 1.881 \text{ sqm} \quad 1 \text{ m} = 1.0936 \text{ yd.}$$

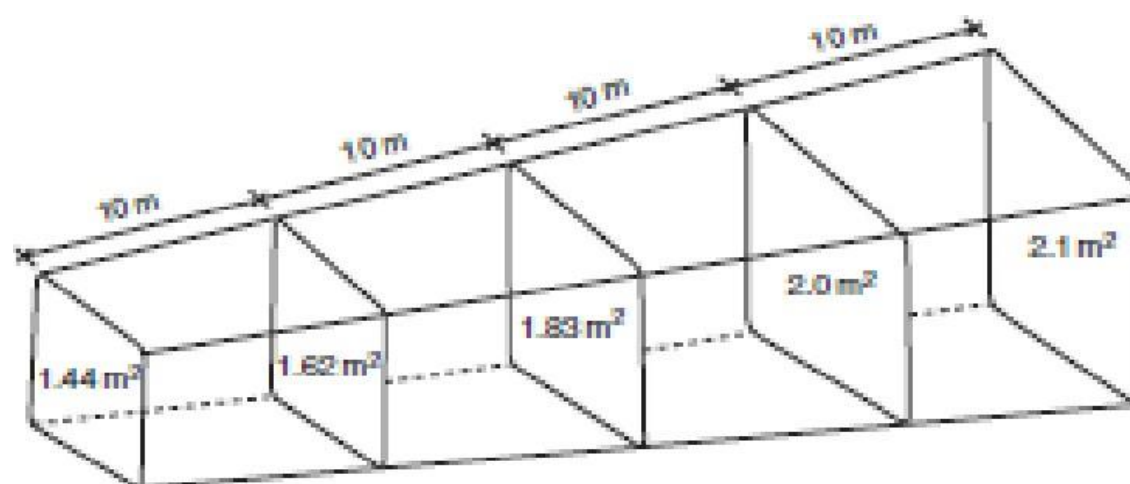
$$= 1.881 \times (1.0936)^2 = 2.25 \text{ sq.yds}$$

$$\text{Max Capacity} = (4.5/3.281)^2 \times 1.5 = 2.8216 \text{ cum}$$

$$= 2.8216 \times 1000 \text{ liter} = 2821.65 \text{ liters}$$

Question 7

The cross-sectional areas of a trench at 10 m intervals are shown in Figure. Use the trapezoidal rule and Simpson’s rule to calculate the volume of earth excavated?



Solution:

$$A_1 = 1.44\text{m}^2, A_2 = 1.62\text{m}^2, A_3 = 1.83\text{m}^2, A_4 = 2.0\text{m}^2, A_5 = 2.1\text{m}^2$$

$$\text{Volume} = \text{Width of strip} \times \frac{1}{2} (\text{first area} + \text{last area}) + (\text{sum of the remaining areas})$$

$$\text{Volume} = 10 \times \frac{1}{2} (1.44 + 2.1) + (1.62 + 1.83 + 2.0)$$

$$= 10 \times [(1.77) + (1.62 + 1.83 + 2.0)]$$

$$= 10 \times [1.77 + 5.4]$$