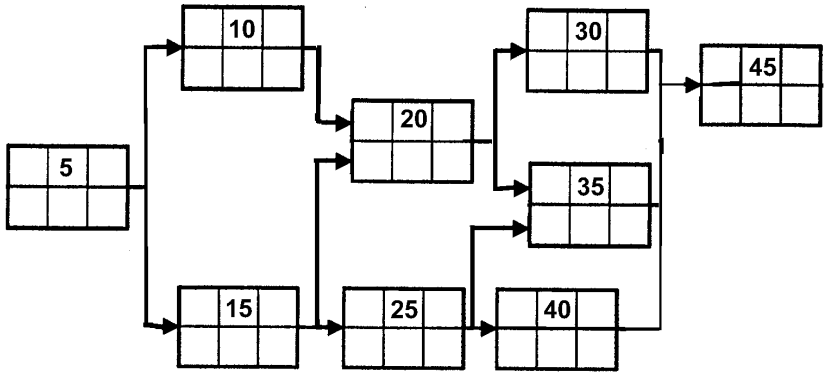
Civil Engineering

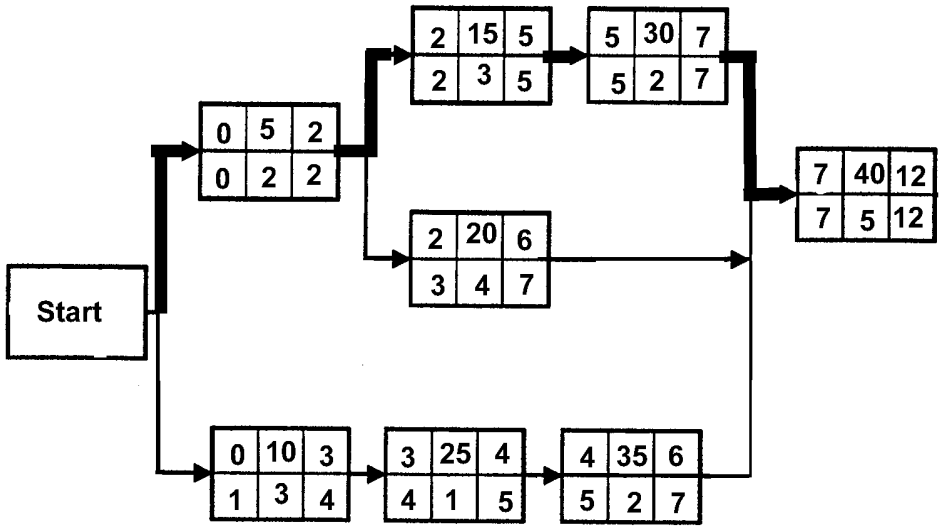
CVG 4173 **Construction Management**

Solution **Assignment # 3**

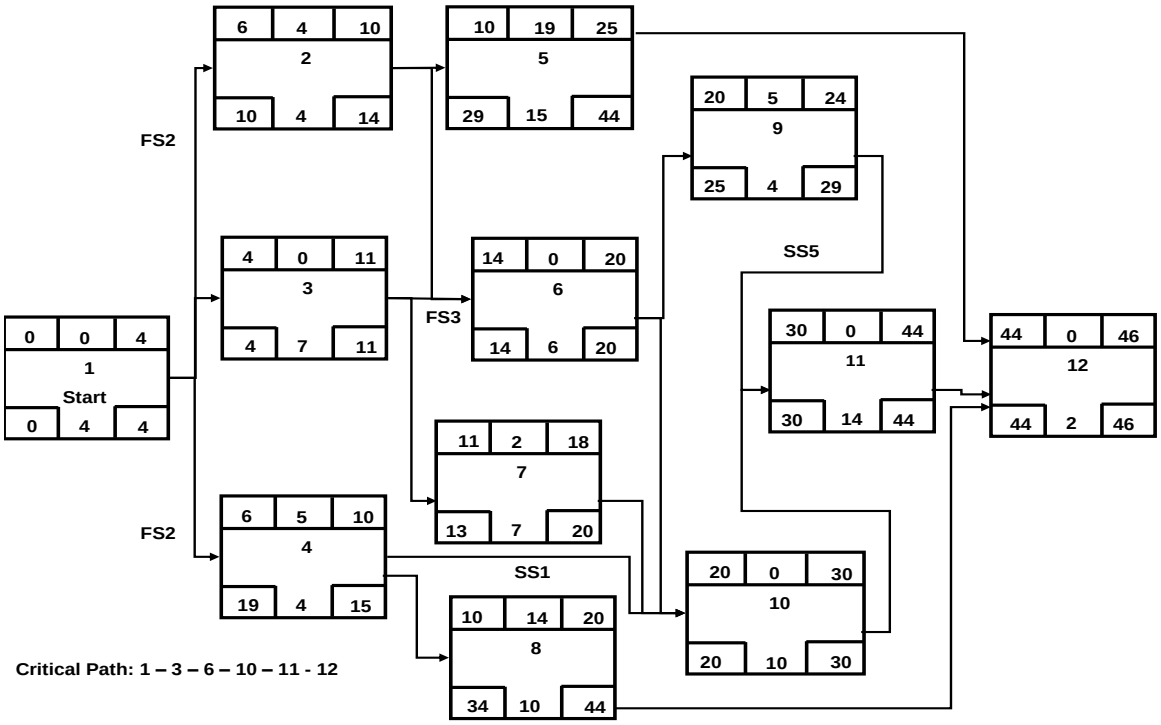
Solution of Question 1:



Solution of Question 2:



Solution of Question 3:



Critical Path: 1 – 3 – 6 – 10 – 11 - 12

Solution of Question 4:

Activity	Duration: Optimistic (T_o)	Most Likely (T_m)	Pessimistic (T_p)	Expected Duration (T_e)	Standard Deviation (σ_e)	Variance $V_e = \sigma_e^2$
A	2	4	7	4.167	0.833	0.694
B	5	8	14	8.500	1.500	2.250
C	4	6	8	6.000	0.667	0.444
D	2	2	2	2.000	0	0
E	7	10	21	11.333	2.333	5.444
				$T_E = 32$		$V_E = 8.833$

$$T_E = 32 \text{ days}$$

$$V_E = 8.833 \text{ days}$$

and

$$\sigma_E = \sqrt{8.833} = 2.972 \text{ days}$$

Note that $\sigma_E \neq \sum_{i=1}^{n} (\sigma_E)_i$

1. *The probability that the project will finish by the end of day* 32. Using equation 11.7, we find that $Z = (32 - 32)/2.972 = 0$ From the Z table (Table 11.1). we find that

$$\Pr(T_S \leq 32) = 0.5 = 50\%$$

Solution of Question 5:

Actual volume/ft of trench = $\frac{30}{12} \text{ x } 5 \text{ x } \frac{1}{27} = 0.46 \text{ BC}$

Load factor = 0.77 (From table)

Standard cycles/h = 160 (From table)

% maximum depth = $\frac{5.0}{16.0} \text{ x } 100 = 31\%$

Swing-depth factor = 1.16 (From table)

(85^o swing, 31% maximum depth)

Heaped bucket volume = 0.75 LCY (0.57 LCM)

Bucket fill factor (average) = 0.80 (From table)

Job efficiency = 0.70

Trench adjustment factor = 0.98 (From table)

Production (loose) = C x S x V x B x E

= 160 x 1.16 x 0.75 x 0.80 x 0.70 x 0.98 = 76 LCY/h

Trench production = $\frac{59}{0.46} = 128 \text{ ft/h}$

Solution of Question 6:

Standard cycles/h = 150 (From table)
Swing factor (150^o swing) = 0.89 (From table)
Heaped bucket volume = 4.0 LCY
Bucket fill factor (average) = 0.80 (From table)
Job efficiency = 50 / 60 = 0.833
Load factor = 0.77 (From table)
Production (loose) = C x S x V x B x E
= 150 x 0.89 x 4.0 x 0.80 x 0.833 = 356 LCY/h
= 356 x 0.77 = 274 BCY/h

Solution of Question 7:

Effective grade haul = 12%

Effective grade return = 4%

Maximum speed haul = 6.8 mph (From graph)

(12% effective grade, rated load)

Maximum speed return = 31 mph

(4% effective grade, empty)

Average speed factor haul = 0.86 x 0.86 = 0.74 (From table)

Haul time = $\frac{2000}{6.8 \text{ x } 0.74 \text{ x } 88} = 4.5 \text{ min}$

Return time = $\frac{2000}{31 \text{ x } 0.74 \text{ x } 88} = 1.0 \text{ min}$

Travel time = 4.5 + 1.0 = 5.5 min

Solution of Question 8:

Blade load = 10 LCY

Fixed cycle time = 0.15 min (From table)

Haul time = $\frac{95}{1.5 \text{ x } 88} = 0.72 \text{ min}$

Return time = $\frac{95}{5 \text{ x } 88} = 0.22 \text{ min}$

Cycle time = 0.15 + 0.72 + 0.22 = 1.09 min

Production = $10 \text{ x } \frac{60}{1.09} \text{ x } 0.83 = 457 \text{ LCY/h}$