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| King Saud University | **CE 417** |  |
| Collage of Engineering | **Ch. 2** | Eng. Saad Al-Jadhai |
| Civil Engineering Department | **Tutorial No.2** | 2nd semester 1431-1432 |

Pit Excavation:

Volume = Horizontal area × Average depth

Trench Excavation:

*L*

*B*

*d*

Volume = Cross section area × Length

 V = (B × d) × L

Trench

Large Areas:

Volume = Horizontal area × Average depth

Average depth = (sum of products of depth × Weight) / sum of weight

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14619.2 BCM

19111.11 BCY

1.31

4.3

1.31m

4.3 ft

48

48

No. of weights = (4 \*1) + (10\*3 ) + (6 \* 4) = 48

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 50 | 50 | 50 |  |
| 50 | 6.5 | 6 | 5.5 | 4.2 |
| 50 | 4.2 | 6.5 | 6.2 | 3.2 |
| 50 | 4 | 2.5 | 3.5 | 6.5 |
|  | 3.5 | 4 |  |  |

Part 1:

Corner points= 6.5 + 4.2 + 6.5 + 4 + 3.5 = 24.7

Border points = 6 + 5.5 + 3.2 + 3.5 + 4 + 4.2 = 26.4

Three weight point = 2.5

Interior Point = 6.5 + 6.2 = 12.7

No. of weights = 5 (1) + 6 (2) + 1 (3) + 2 (4) = 28

Average depth 1 = $\frac{1 \left( 24.7 \right)+ 2 \left( 26.4 \right)+ 3 \left( 2.5 \right)+ 4 ( 12.7 )}{28}$ = 4.85 m

|  |  |  |  |
| --- | --- | --- | --- |
| 6.5 | 6 | 5.5 | 4.2 |
| 4.2 | 6.5 | 6.2 | 3.2 |
| 4 | 2.5 | 3.5 | 6.5 |
| 3.5 | 4 |  |  |

Area1 = 7 \* 50 \* 50 = 17500 m2

Volume 1 = 4.85 \* 17500 = 84875 m3

Part 2

6.5

2.5

3.5

Average depth 2 = $\frac{2.5+3.5+6.5+4 }{4}$ = 4.125 m

Area 2 = 100 \* 50 \* 0.5 = 2500 m2

4

Volume 2 = 4.125 \* 2500 = 10312.5 m3

Total volume = Volume 1 + Volume 2 = 84875 + 10312.5 = 95187.5 m3



Solution:

Average depth = $\frac{8.2+6.6+6+6.9+6.8+7.4 }{6}$ = 6.983 ft

Area = ( 45 \* 50 ) – ( 24 \* 17 ) = 1842 ft2

1 yr = 3 ft

1 yr3 = 27 ft3

Volume = 6.983 \* 1842 = 12862.69 ft3

 = 12862.69 / 27 = 476.39 BCY

How many truck loads of truck hauling an average volume of 4 LCY would be required to haul the excavated volume from the basement shown if it is common earth ?

10 ft

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 5.1 ft |  |  |  |  |  |  | 5.2 ft |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 10 ft |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 4.3 ft | 4 ft | 4 ft |  |  |  |  |  | 4 ft | 4 ft |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 6 ft |  |  |  |  |  |
| 4 ft | 3.6 ft |  |  |  |  |  |  | 4.2 ft | 3.9ft |

|  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | part | 3 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| part | 1 |  |  |  |  |  |  | part | 2 |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

Part 1

Average depth=(4.3+4+4+3.6) / 4 = 3.97 ft

Area = 2 \* 4 = 8 ft2

Volume = 8 \* 3.97 = 31.8 ft3

Part 2

Average depth= (4 + 4 + 4.2 + 3.9) / 4 = 4.025 ft

Area = 2 \* 4 = 8 ft2

Volume = 8 \* 4.025 = 32.2 ft3

Part 3

Average depth = (5.1 + 5.2 + 4.3 + 4 + 4 + 4) / 6 = 4.43 ft

Area = 10 \* 6 = 60 ft2

Volume = 4.43 \* 60 = 265.8 ft3

Total volume = 31.8 + 32.2 + 265.8 = 329.8 ft3

 = 329.8 / 27 = 12.21 BCY

Load factor = 0.8 🡪 from table 2-5

Loose volume = 12.21 / 0.8 = 15.26 LCY

No. of Truck loads = 15.26 / 4 = 3.81 🡪 = 4 truck loads

**Mass diagram:**

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**1700**

**-35**

**40**

**-42**

**52**

**-65**

∑cut - ∑ fill = $\left\{\begin{array}{c}+ve\rightarrow waste\\-ve \rightarrow borrow\end{array}\right.$

Volume of borrow

∑cut - ∑ fill = -35×103 🡪 borrow

Volume of waste = 0

Average length of hole for section 3 = 2050 - 1700 = 350 m

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ∑ | ? | 4 | 3 | 2 | 1 |  |
| 199 ×103 | ----- | 40×103 | 42×103 | 52×103 | 65×103 | Cut (m3) |
| 234 ×103 | 35×103 | 40×103 | 42×103 | 52×103 | 65×103 | Fill (m3) |

**2050**