**Q1. Earth work: 30 points**

**Question:** A pavement base layer is to be constructed in 30 days. Find the necessary **truck numbers.**

|  |  |
| --- | --- |
| shift (hours/day) | 8+8  |
| Base layer density (t/m3) | 2 |
| Ѳtemporary (%) | 20 |
| Ѳpermenant (%) | 9.8 |
| Loader efficient (m3/saat) | 130 |
| Truck loading volume capacity (m3) | 6 |
| Truck engine power  | 250 |
| Truck empty weight (kgf) | 4250 |
| Load and unload time (minutes) | 2.75 |
| Wr (kgf/kgf) | 0.15 |
| Work site efficiency (%) | 85 |
| Project time duration (day) | 30  |
| Max. trafik speed (km/hour) | 60 |

Base Layer

Lenght =14000 mt

 10556 mt

Base Layer

12 mt

80 cm

Stone quarry

V0

Slope= 0 % (%)= 0

**Answer:**

|  |
| --- |
| **Soil** |
| Excavated volume necessary (m3) | $$V0=\frac{Vk}{(1+Ѳk)}=\frac{14000\*12\*0.8}{(1+0.098)}=122404.37 m3$$ |
| Excavated volume necessary per day (m3/day) | $\frac{Vk}{30}$ = $\frac{122404.37}{30}$= 4080 |
| **Loader** |
| Loader efficiency (m3/day) |  130x(8+8)=2080 |
| Loader number needed to complet the work in 30 days | $$ \frac{4080}{2080}=1.96=2 $$ |
| Vdeparture (km/hours) | $$ \frac{0.243x250}{14.25(0.15+0)}=28.42 $$ |
| Vreturn (km/hours) | $$ \frac{0.243x250}{4.25(0.15+0)}=95>60 so take 60$$ |
| **Truck** |
| Load (tons) | $$ \frac{2x6 }{(1+0.2)}=10$$ |
| t departure (minutes) | $$ \frac{17.556}{28.42}=0.618 hours=37.06 $$ |
| t return (minutes) | $$ \frac{17.556 }{60}=0.2926 hours=17.556$$ |
| One period time (minutes) |  37.06+17.556+2.75=57.366  |
| D truck efficiency (m3/day) | $$ \frac{0.85x6x60x(8+8) }{\left(1+0.2\right)x57.366}=71.122$$ |
| Number of truck =$\frac{Deks}{Dtruck}$ | $$ \frac{2x2080 }{71.122}=58$$ |
|  2x2080=4160 |

**Q2. Students with only singel number (example 20509) will answer**

**15+15 (profile) +150 points (tables) borrow=transfer=50 mt**

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| **20 points** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **20****points** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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 Draw the profile in the second graph and show the earth transfer directions

L dozer = ?

|  |  |  |  |
| --- | --- | --- | --- |
|  | L (m) | V (m3) |  (m4) |
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 L skrayper =?

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|  | L (m) | V (m3) |  (m4) |
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**Q2. Students with only even numbers (example 20510) will answer**

**15+15 (profile) +15 points (tables) borrow=transfer=50 mt**

**20 points**

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| **20 points** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **20****points** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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 Draw the profile in the second graph and show the earth transfer directions

L dozer = 28000/800=35m

|  |  |  |  |
| --- | --- | --- | --- |
|  | L (m) | V (m3) |  (m4) |
| 10-110 | 50 | 400 | 20000 |
| 160-200 | 20 | 200 | 4000 |
| 200-240 | 20 | 200 | 4000 |
|  |  | $$\sum\_{}^{}=800$$ | $$\sum\_{}^{}=28000$$ |
|  |  |  |  |

L skrayper =47000/400=117.5m

|  |  |  |  |
| --- | --- | --- | --- |
|  | L (m) | V (m3) |  (m4) |
| 0-120 | 110 | 100 | 11000 |
| 120-270 | 120 | 300 | 36000 |
|  |  | $$\sum\_{}^{}=400$$ | $$\sum\_{}^{}=47000$$ |

**Q3. 25 points Find the average transfer distance ? Platform width= 7 mt.**

18+756

 13+756

 9+756

3+756

0+756

 A B C

 10 km 3 km 4 km

20 cm

25 cm

**Solution:** 3.756 -0.756 =3 km

Between A and B : 10+x=3+(10-x) => x=1.5 km

Between B and C : 3+y=4+(5-y) => y=3 km

|  |  |  |
| --- | --- | --- |
| **Distance (m)** | **Volume(**$m^{3}$**)** | **Moment(**$m^{4}$**)** |
| 10000+3000/2=11500 | 7x0.25x3000=5250  | 60375000 |
| 10000+(1500/2)=10750 | 7x0.25x1500=2625 | 28218750 |
| 3000+4000+(4500/2)=9250 | 7x0.25x4500=7875 | 72843750 |
| 3000+(3000/2)=4500 | 7x0.2x3000=4200 | 18900000 |
| 4000+(2000/2)=5000 | 7x0.2x2000=2800 | 14000000 |
|  | ∑Volume = 22750 m3 | ∑M = 194337500 |

$M\_{avg}$= $\frac{194337500}{22750}$ = 8542.31 m

**END**

**NO FURTHER QUESTION**