University Of Technology
Building and Construction Eng. Dept.
Exam – Final- – 2014/2015
Subject : Managemant . Equipement Class:3
Time : 3 Hours
Date : / 6 / 2015

Branch : Construction
Examiner :D.Raid AL-Lamy

Q1- A -A (60000 m^3) of hard, tough clay earth is required to be excavated during 3 months. Find the smallest power shovel that can be used to do the job, using the following information:

– Actual depth of (2.7m) – Angle of swing of (45°). – Job conditions are poor. – Management conditions are good.	– Working day=8 hrs. – Working hour=50 min. – Percentage of stops=15%. – Month=30 days.

Q1-B- Determine the Factors that affect the cost of owning and operating construction equipment include?

Q2 -A - Determine the number of strokes per min (n) for a duplex double-acting size (150mm × 300mm) if the total pumping head including friction loss in pipe is (48) m and the efficiency of pump is 60% and the minimum horsepower is 32 hp , the weight of 1 liter of water is 1 kg. Assume a water slippage of 3%.?

Q2 –B- The owner must consider all costs related to the ownership and operation of the equipment . What are these costs?

Q3 Select the smallest power shovel required to excavate (56000 m3 bank measure) of hard, tough clay earth in 110 working days of 8hrs each. The average depth of cut will be (2.7m) and the average angle of swing will be (90o), noting that the job conditions are excellent, the management conditions are good and the working hour is 60 min.?

Q4 -A- Determine the Maximum size batch of paving mixer which Maximum output per hour is 90 m3 and it is possible to produce a batch of concrete in 60 sec.?

Q4 -B-What are the Disadvantages of owning equipment compared to renting it are?

Q5 –A- Determine the probable cost per hour for owning and operating a (20 m^3) truck with six rubber tires, using the following information:

Cost of Equipment	$92623
Cost of tires	$12113
Engine, Diesel	250 hp
Crankcase capacity	53 liter
Hours between oil changes	80 hr
Operating factor	0.6
Useful life, with no salvage value	6 years
Life if tires	4000 hrs
Repairs to tires	15% of depreciation of tires
Maintenance	60% of Depreciation
Investment	20% of Average Value
Hours operated per year	2000
Cost of fuel per liter	0.33 $/liter
Cost of oil per liter	0.53 $/liter

Q5 –B- Define the following terms:

Coefficient of Traction , Rolling Resistance , Rim Pull, Grad ability:

Q6- A tractor whose weight is (18 tons) has a drawbar pull of (2100 kg) in sixth gear when operated on a level road having a rolling resistance of (50 kg/ton); if the same tractor is operated on another level road having a rolling resistance of (40kg/ton) then:

1. Will the drawbar pull of the tractor be reduced or increased, find the effective drawbar pull?
2. If the road have a slope of (5%), what will the effective drawbar pull be, if the tractor moves:
   a) Up the road.
   b) Down the road.

Equations

Check Bending: $L = 1.29h\sqrt{\frac{fb}{w}} =$	$P = 7 + \frac{1414R}{1.8T + 32}$	$P = 7 + \frac{2079 + 440R}{1.8T + 32}$
Check Shear: $L = \frac{2vbh}{1.5w} =$	**Check Deflection:** $L = 0.787 \times \sqrt[4]{\frac{EID}{w}}$	$R = \frac{Out\ Put\ (m^3/hr)}{b \times l}$
Fuel consumed per hour = operatingfactor × hp × engine consumption $q = \frac{hp \times f \times 0.0027(kg/hp-hr)}{0.89(kg/l)} + \frac{C}{t}$	$\overline{P} = \frac{P(N+1)}{2N}$ $W = \frac{w\,Q\,h}{e}$	$\overline{P} = \frac{P(N+1) + S(N-1)}{2N}$ $Q = C \times \frac{\pi\, d^2\, l\, n}{4} \times 10^{-6}$

Table (8-2) - Ideal Output of Power Shovel, in Cubic Meter Per 60-Min Hour, Bank Measure.

Class of material	Size shovel, cubicmeter								
	0.3	0.4	0.6	0.8	1	1.2	1.4	1.6	2
Moist loam or high sand clay	1.1 65	1.4 88	1.6 126	1.8 157	2.0 190	2.1 218	2.2 245	2.4 271	2.6 310
Sand and gravel	1.1 61	1.4 84	1.6 118	1.8 153	2.0 178	2.1 206	2.2 229	2.4 252	2.6 298
Good common earth	1.4 54	1.7 73	2.1 103	2.4 134	2.6 160	2.8 183	2.9 206	3.1 229	3.4 268
Hard, tough clay	1.8 38	2.1 57	2.4 84	2.7 111	3.0 137	3.3 156	3.5 180	3.7 202	4.1 236
Well-blasted rock	— 30	— 46	— 72	— 95	— 118	— 137	— 156	— 175	— 210
Wet, sticky clay	1.8 19	2.1 30	2.4 53	2.7 73	3.0 91	3.3 110	3.5 125	3.7 141	4.0 175
Poorly blasted rock	— 11	— 19	— 38	— 57	— 73	— 88	— 107	— 122	— 149

Table (8-3) Conversion Factor for Depth of Cut and Angle of Swing

Angle of swing , deg.							Percent of Optimum Depth
180	150	120	90	75	60	45	
0.59	0.65	0.72	0.8	0.85	0.89	0.93	40
0.66	0.73	0.81	0.91	0.96	1.03	1.1	60
0.69	0.77	0.86	0.98	1.04	1.12	1.22	80
0.71	0.79	0.88	1.00	1.07	1.16	1.26	100
0.7	0.77	0.86	0.97	1.03	1.11	1.20	120
0.66	0.73	0.81	0.91	0.97	1.04	1.12	140
0.62	0.67	0.75	0.85	0.90	0.96	1.03	160

Table (8-4) Coefficient Related to Management and Job Conditions*

Job Conditions	Management Conditions			
	Excellent	Good	Fair	Poor
Excellent	0.84	0.81	0.76	0.70
Good	0.78	0.75	0.71	0.65
Fair	0.72	0.69	0.65	0.60
Poor	0.63	0.61	0.57	0.52

Model 5-M				
Total Head including Friction, (m)	**Capacity, (liters per min)**			
	Height of Pump above Water, (m)			
	3.0	**4.5**	**6.0**	**7.5**
5	322	-	-	-
6	318	257	-	-
8	310	254	-	-
9	299	250	186	133
12	269	227	174	125
15	233	197	155	106
18	159	151	121	83
21	83	83	75	45
Model 8-M				
Total Head including Friction, (m)	**Capacity, (liters per min)**			
	Height of Pump above Water, (m)			
	3.0	**4.5**	**6.0**	**7.5**
6	511	-	-	-
8	507	443	-	-
9	500	435	352	246
12	466	413	333	239
15	413	374	307	223
18	341	318	265	193
21	250	246	216	155
24	151	151	151	106

Model 10-M				
Total Head including Friction, (m)	Capacity, (liters per min)			
	Height of Pump above Water, (m)			
	3.0	4.5	6.0	7.5
8	628	-	-	-
9	625	530	416	-
12	598	530	416	284
15	549	492	401	265
18	477	443	367	257
21	386	379	322	227
24	280	280	257	182
27	151	151	151	121

Table (10-1) – Minimum Capacities for M-Rated Self-Priming Centrifugal Pumps Manufactured in accordance with Standards of the Contractors Pump Bureau

Model 15-M				
Total Head including Friction, (m)	Capacity, (liters per min)			
	Height of Pump above Water, (m)			
	3.0	4.5	6.0	7.5
6	980	-	-	-
9	946	795	757	-
12	912	784	670	606
15	852	765	651	530
18	746	746	640	530
21	606	606	606	522
24	473	473	473	473
27	363	363	363	363
Model 18-M				
Total Head including Friction, (m)	Capacity, (liters per min)			
	Height of Pump above Water, (m)			
	3.0	4.5	6.0	7.5
8	1139	-	-	-
9	117	965	757	-
12	1045	946	757	613
15	946	897	749	602
18	818	802	689	553
21	659	659	598	481
24	488	488	473	394
27	310	310	310	280
29	216	216	216	216
Model 20-M				
Total Head including Friction, (m)	Capacity, (liters per min)			
	Height of Pump above Water, (m)			
	3.0	4.5	6.0	7.5
9	1260	1060	890	625
12	1192	1022	871	613
15	1098	965	833	583