THE OPEN UNIVERSITY OF SRI LANKA
Department Of Civil Engineering
Postgraduate Diploma in Technology - Construction Management - Level 7

00035

CEX7111 – Construction Plant Management & Construction Safety

FINAL EXAMINATION - 2012/2013

Time Allowed: Three Hours

Date: 2013 - 08 – 14 (Wednesday) Time: 0930 - 1230 hrs

Answer Four (04) questions with at least one (01) from Section B.

Section A: Construction Plant Management

Q1.

i.) The classification for construction equipment proposed by the Society of Automotive Engineers USA (SAE) is based on *six (06)* **broad categories**. Describe with justifications, *four (04)* of these categories, which are more applicable in the context of the Sri Lankan construction industry. *(08 Marks)*

ii.) The role of **Management** can be broadly sub divided in to four areas. Name and describe these *four (04)* sub areas of Management with reference to construction project execution. *(08 Marks)*

iii.) Describe the applicable time components, which make up the total time for a construction equipment and discuss the difference between **Operational Availability**, and **Mechanical Availability** of an equipment. (09 *Marks)*

Q2.

i.) For projects such as dam constructions involving large earthworks in boulder-less soils, **Scrapers** are the generally preferred option for earth cutting moving and spreading. Describe *three (03)* technical aspects under which **Scrapers** could be classified. *(08 Marks)*

ii.) For an **Articulated Motor Grader** of 2.0 m mould board propelled by **twin tandem driven axels at rear** and **power shift transmission,** describe the different **Power Trains** clearly distinguishing the **hydraulic power flow** and **mechanical power flow**. *(08 Marks)*

iii.) Develop an expression for evaluating the rate of production an **Articulated Wheeled Loader** serving a truck from a stockpile using V shape loading. You should use the physical capacity of the machine, positioning/changing times, speed of the machine, etc., for this development. *(09 Marks)*

Q3.

i.) High pressure hydraulic systems play a major role in actuators of construction equipment. At the heart of such systems is the hydraulic pump delivering the pressurized fluid. For efficient and economical operation, discuss the advantages of a variable displacement hydraulic pump as compared to constant displacement pumps of older design. *(10 Marks)*

ii.) An embankment of 6.0 m average width and 1.5 m average height has to be constructed for one kilometer length, within 20 days. A contractor who intends to bid for the job has a hydraulic excavator in his inventory but will require to hire dump trucks from an equipment supplier. Therefore, he needs to know the number of trucks required to carryout the work and whether the work can be accomplished within the time allocated using his excavator only (assume that the compaction of the fill shall be done concurrently by another contractor with adequate compaction equipment). Make your recommendation to the prospective contractor based on the information given below.

a.) Cutting loading of the soil will be done using a hydraulic excavator with 2.5 m^3 of effective bucket capacity and a cycle time of 2 minutes.

b.) The haul distance is 6.0 km one way.

c.) The average working day is 10 hrs.

d.) Capacity of each truck is 10 m^3.
e.) Average speeds of truck with load, 12 km/hr. & without load, 20 km/hr.
f.) Dumping time and spot times are 3 minutes and 2 minutes respectively.
g.) Swell factor for the soil is 1.3. *(15 Marks)*

Q4.

i.) Clearly explain the reason for considering 'interest on capital' as an owning cost when economics of a construction plant are evaluated. *(05 Marks)*

ii.) Identify the most suitable method to represent the depreciation of construction equipment after describing the *three (03)* common ways of quantifying depreciation. *(05 Marks)*

iii.) Evaluate the **average hourly owning and operating costs** during the *second (02)* year of service for a class D8 Bulldozer with a diesel power plant of 200 kW power rating.

Purchase price	-	Rs. 15,000,000/=
Interest on capital	-	18 % per annum
Annual usage	-	3,000 Hours
Depreciation method	-	Declining balance method [Remaining Value = $C(1 - r)^y$]
Rate of depreciation (r)	-	0.3 (30%)
Registration fee	-	Rs. 15,000/= per annum
Insurance premium	-	0.20% of the value of equipment at the beginning of the year

Specific fuel consumption	-	0.21 kg/kW/Hour
Specific gravity of diesel fuel	-	0.82
Price of diesel fuel	-	Rs. 121/= per liter
Average engine load factor	-	80 %
Average lubricant/filter change interval	-	360 Hours
Total lubricant capacity	-	25 liters
Average lubricant cost	-	Rs. 400/= per liter
Number of filters to be changed	-	2 per lubricant change interval
Average cost of a filter	-	Rs. 2000/=
Annual Maintenance/Repair cost	-	25 % of annual depreciation
Operator wages	-	Rs. 250/= per hour

(15 Marks)

Section B Construction Safety and First Aid

Q5.

a) Write an explanatory note on construction site accidents clearly indicating direct and indirect costs associated with them. *(05 Marks)*

b) Explain the main causes for site accidents with particular reference to conditions in Sri Lankan construction sites. *(05 Marks)*

c) State your opinion on the mental attitudes of management and workers, which result in poor safety standards at construction sites in Sri Lanka. *(05 Marks)*

d) Write an explanatory note on Safety and Health Legislation. *(05 Marks)*

e) Describe the requirement of insurance for a construction site by the contractor. *(05 Marks)*

Q6.

a) Identify and clearly explain the importance of **first aid**. *(05 Marks)*

b) Define **Shock** in an accident victim and enumerate its major signs. *(05 Marks)*

c) Write an explanatory note on Cardio Pulmonary Resuscitation (CPR). *(05 Marks)*

d) Explain **Fainting** and its major causes. *(05 Marks)*

e) What are the main objectives of first aid in treating a **Burn** victim? *(05 Marks)*