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

033

CEX7111/CEP 2111/CEE 7111 – Construction Plant Management & Construction Safety

FINAL EXAMINATION - 2006

Time Allowed: Three Hours

Date: 2007 - 03 – 27 (Tuesday) Time: 0930 - 1230 hrs

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

Section A : Construction Plant Management

Q1.

i.) The **Total Hours** with regard to construction equipment deployed in the field can be subdivided to various components based on the state of the equipment. Describe these time components, which make up the total hours, for construction equipment and discuss the difference between **Operational Availability**, and **Mechanical Availability** based on their definitions.

(08 Marks)

ii.) The classification for construction equipment proposed by the Society of Automotive Engineers USA (SAE) is based on *six (06)* **broad categories**. Describe with justifications, *three (03)* of these categories, which are more applicable in the context of the Sri Lankan construction industry and other related areas.

(08 Marks)

iii.) Under the three headings a.) Size of the project, b.) Location of the project, and c.) Expected duration of the project, discuss the relative viability of mechanized construction as opposed to manual methods, for a country such as Sri Lanka.

(09 Marks)

Q2.

i.) Scrapers are generally used in projects involving large earthworks, and boulder less soils. Describe *three (03)* major considerations under which Scrapers are classified.

(08 Marks)

ii.) Describe the **Power Train** in detail, of an **Articulated Motor Grader** of 2.0 m mould board with **twin tandem driven axels at rear and power shift transmission**. In your description clearly distinguish the **hydraulic power flow** and **mechanical power flow.**

(08 Marks)

iii.) Articulated front-end loaders are popular in quarries where granular materials from stockpiles are loaded into transporters. Develop an equation for calculating the production rate of an articulated front-end loader serving a truck from a stockpile using V shape loading. You should use the physical characteristics/dimensions of the machine, positioning/changing times, speed of the machine, etc., to develop this equation.

(09 Marks)

Q3.

i.) In the recommissioning process of the KKS Cement factory, raw material supply systems has to be established. For the supply of Shale, one of the raw materials, a mining site 7.5 km away from the factory had been selected. Shale is loosened by a hydraulic breaker. In order to supply the demand of the cement-making kiln, shale has to be delivered at the factory at a rate of 40 tons per hour. If a crawler mounted Hydraulic Shovel with 2.5 m^3 of bucket capacity, bucket fill factor of 0.75 and a cycle time of 2.0 minutes is to be utilized at the shale mining site, determine the number of haul trucks required for transport, based on the information given below.

a.) Bulk density of shale is 1.60 tons/m^3.
b.) Capacity of each truck is 15 tons.
c.) Average speeds of truck with load, 15 km/hr. & without load, 30 km/hr.
d.) Dumping time at the factory and spot time at the shovel for a truck are 3.0 minutes and 2.0 minutes respectively.

(15 Marks)

ii.) Discuss the advantage of using a hydraulic shovel as compared to a back hoe type hydraulic excavator in a loading operation as outlined in i.) Above.

(10 Marks)

Q4.

i.) Briefly discuss *three (03)* possible methods of quantifying depreciation of construction plant and identify the most suitable method with reasons.

(05 Marks)

ii.) Using the given data below, compute the average hourly owning and operating costs in the third year of its operation for a Case Loader-Backhoe combination machine The machine is powered by a 115 HP four cylinder turbo charged diesel engine. (You may assume and state any other factors not provided).

Purchase price	-	Rs. 5,000,000/=
Interest on capital	-	18 % per annum
Annual usage	-	3,000 Hours
Useful lifetime	-	15,000 Hours
Scrap value	-	Rs. 1,000,000/=
Registration fee	-	Rs. 8,000/= per annum
Insurance premium	-	1.5 % of the value at the year beginning
Depreciation method	-	Straight line
Specific fuel consumption	-	0.16 kg/HP/Hour
Specific gravity of diesel fuel	-	0.80
Average engine load factor	-	60 %
Average lubricant/filter change interval	-	300 Hours
Total lubricant capacity (incl. hydraulic fluid)	-	20 liters
Average lubricant cost	-	Rs. 250/= per liter
Number of filters to be changed	-	3 per lubricant change interval
Average cost of a filter	-	Rs. 1200/=
Annual Maintenance/Repair cost	-	110 % of annual depreciation
Operator wages	-	Rs. 120/= per hour

(20 Marks)

Section B – Construction Safety

Q5.

i.) Name and explain *five (05)* accident prevention measures that should be considered at the Planning stage of a Construction Project with particular reference to conditions prevailing in Sri Lanka.

(08 Marks)

ii.) Psychological outlook of participants in any group activity will have a significant effect on the success or failure of that activity. This hold true also in the case of construction site safety. Compare your opinion on the mental attitudes of workers and management, which result in poor safety standards at construction sites in Sri Lanka.

(08 Marks)

iii.) It is generally understood that the legal framework pertaining to welfare and safety of the work force is not reflecting the needs of the times. What are the basic drawbacks in the Safety and Health Legislation in relation to present socio/economic and work environment?

(09 Marks)

Q6.

i.) Clearly describe the main objectives of administering first aid on a Burn victim?

(08 Marks)

ii.) One of the most common medical conditions that need first aid at construction sites are wounds. Clearly define a "Wound" and describe the *five (05)* types of wounds that can be inflicted on a person involved in construction site activities.

(08 Marks)

iii.) When does Cardio Pulmonary Resuscitation (CPR) need to be applied to a person? Explain in detail the two main steps involved in administering Cardio Pulmonary Resuscitation.

(09 Marks)