



CEX7111 - Construction Plant Management & Construction Safety

FINAL EXAMINATION - 2017/2018

Time Allowed: Three Hours

Date: 2019 - 02 - 10 (Sunday)

Time: 0930 - 1230 hrs

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

Section A: Construction Plant Management

Q1.

- i.) The context of Management can be dealt under four major functions. Name and describe these *four* (04) functions of Management with reference to construction project execution. (08 Marks)
- ii.) The total time of a construction equipment deployed in the field can be subdivided to various components based on the state of the equipment. Enumerate the applicable time components, which make up the total time, for a construction equipment with short descriptions of each component. Through the above descriptions define and discuss the difference between **Operational Availability**, and **Mechanical Availability** of a construction equipment. (08 Marks)
- ii.) The Japan Construction Mechanization Association (JCMA) had produced a classification for construction plant under *nine* (09) major categories. With notes, describe *four* (04) of these categories. (09 Marks)

Q2.

- i.) In detail, describe the **Power Train** of an **Articulated Wheeled Loader** of 2.0 m³ bucket capacity with **four wheel drive** and **power shift transmission**. In your description pay special attention to **hydraulic power flow** for different actuators of the machine. (08 Marks)
- ii.) Describe *three* (03) main **physical attributes** on which **Motor Graders** can be classified. Discuss alternative features available under each category and the utility of these for different types of construction operations. (08 Marks)
- iii.) Develop an equation for calculating the production rate of a double drum tandem, compaction Roller. You should use the physical characteristics/dimensions of the machine, number of passes required for desired compaction level, speed of the machine, etc., in the development of this equation. (09 Marks)

Q3.

- i.) One kilometer of road length on a 6.0 m wide road got washed off during monsoonal rains. Average height of fill is 1.5 m along the length of the road. The job has to be completed within 20 days. A contractor who intends to bid for the job needs to calculate the number of trucks required to carryout the work and whether the work can be accomplished within the time allocated, based on the information given below.
 - a.) The loading will be done by using a wheeled loader with 2.5 m³ 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 m³.
 - e.) Swell factor for the soil is 1.3.
 - f.) Average speeds of truck with load, 12 km/hr. & without load, 20 km/hr.
 - g.) Dumping time and spot times are 3 minutes and 2 minutes respectively.(15 Marks)
- ii.) Variable displacement hydraulic pumps coupled with mechatronics (or electronic control for mechanical systems) are common in recent construction plant for efficient and economical operations. Clearly describe the advantages of a variable displacement hydraulic pump as compared to constant displacement pumps of older design. (10 Marks)



Q4.

Relevant data on a Dozer tractor with a 140 HP Diesel engine are provided below. Using all relevant data compute the average hourly owning and operating costs during the *fourth (04)* year of its service. (You may assume and state any other factors not provided).

Purchase price -	Rs. 10,000,000/=	Scrap value -	Rs. 2,000,000/=
Annual usage -	2,000 Hours	Useful life time -	16,000 Hours
Interest on capital -	20 % per annum		

Registration fee -	Rs. 5,000/= per annum
Insurance premium -	0.2 % 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 -	70 %		

Lubricant/filter change interval -	350 Hours	Total lubricant capacity -	35 liters
Average lubricant cost -	Rs. 600/= per liter		
Number of filters to be changed -	5 per lubricant change interval		
Average cost of a filter -	Rs. 1500/=		

Annual Maintenance/Repair cost -	110 % of annual depreciation
Operator wages -	Rs. 90/= per hour

(25 Marks)

Section B Construction Safety and First Aid

Q5.

- i.) Psychological outlook of participants in any group activity will have a significant effect on the success or failure of that activity. This holds true also in the case of construction site safety. Clearly state your opinion on the mental attitudes of workers, which result in poor safety standards at construction sites in Sri Lanka. (06 Marks)
- ii.) Name and briefly explain *five (05)* accident prevention measures that should be considered at the Planning stage of a Construction Project. (06 Marks)
- iii.) State the ways through which responsibility for safety is dedicated by the standard conditions of contract used in Sri Lanka. (06 Marks)
- iv.) 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? (07 Marks)

Q6.

- i.) Name and clearly describe the five (05) types of wounds that can be inflicted on a person involved in construction site activities. (06 Marks)
- ii.) Explain causes, signs and symptoms of Convulsion and describe first aid measures that can be applied. (06 Marks)
- iii.) What are the main objectives of first aid in alleviating the condition of a Burn victim? (06 Marks)
- iv.) 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. (07 Marks)

