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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Civil Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX6831/CEX6331 Construction Engineering and Management**
Academic Year	: 2017/18
Date	: 2019/02/03
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Six (6)** questions in **Four (4)** pages.
3. Answer any **Four (4)** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (CBT).
6. Answers should be in clear hand writing.
7. Do not use Red colour pen.

Q1.

(a) The construction industry is a major contributor to the economic development in Sri Lanka. Management of major construction projects can be challenging because of limited resources available, unique risk factors, and lack of construction management expertise. Explain how Sri Lankan construction professionals can face these challenges.

(Marks 07)

(b) Show the importance of providing 'site preparation and services' effectively in a new highway construction project by taking the following two services;

- plant maintenance workshop and standing area
- material storage

(Marks 06)

(c) The excavation is a construction process which is required in almost all the construction sites. Knowing the fact that excavation is among the most hazardous of construction operations, it is the responsibility of project engineer to carryout safer site excavations. Briefly explain methods used for ensuring stability and safety of excavation. (Marks 06)

(d) Write short descriptive notes on 'Pneumatic-tired roller' and 'Smooth-wheel roller'.

(Marks 06)

Q2.

(a) The carriageway that is used for traffic is known as the pavement. Subgrade, sub-base, road base and surfacing are four main elements of a road pavement. Briefly describe design considerations of the above elements. (Marks 06)

(b) The formwork for concrete is a vital component in the construction process. Today, many materials are being used for formwork. Explain the types of formwork used for construction in Sri Lanka. (Marks 06)

(c) Explain three traffic engineering considerations that need to be incorporated in the design of a road. (Marks 06)

(d) The preparation of course aggregate is a manufacturing process which follows a definite flow diagram; the aggregate crushing plant must therefore be arranged to optimise the operation. Draw aggregate process flow diagram and briefly state the primary function of any four components of an aggregate crushing plant.

(Marks 07)

Q3.

(a) Concrete mix design is the process of finding right proportions of cement, water, sand and aggregates for concrete to achieve target strength in structures. Explain separately how size and shape of coarse aggregates affect the properties of concrete. List three most widely used methods of concrete mix design and briefly describe one of them.

(Marks 06)

(b) High-performance concrete (HPC) is a type of concrete that has been designed to be more durable, workable, pumpable and, if necessary, stronger than conventional concrete. On the other hand, the growing scarcity of sand in most parts of the world is a serious issue,

and this has been demonstrated in Sri Lanka as well. If you are assigned as the quality assurance manager in a major concrete batching plant situated in Colombo, what would be your key challenges.

(Marks 07)

(c) Describe the contractor's role in planning the site for concrete pumping operation of a building construction. (Marks 06)

(d) Vibration of concrete is carried out for the sake of consolidation. The main objective of vibration is to compact the concrete and to achieve the maximum possible density of concrete. Briefly explain your understanding of "Over-vibration" and "Re-vibration" while emphasising their consequences on the quality of concrete.

(Marks 06)

Q4.

(a) Dredging is the form of excavation carried out underwater or partially underwater, in fresh waters or ocean waters. List three most widely used types of dredgers and explain one of them in detail. (Marks 06)

(b) Out of the methods available for producing holes in rock, two are applicable for making deep holes. Write a description on each of the two methods.

(Marks 06)

(c) Briefly explain the two common methods of welding and state two advantages and two disadvantages of each. (Marks 06)

(d) The precast concrete industry is continuously evolving, driven by shifts in global markets, increasing customer expectations and pressure from increasing labour costs. Explain two modern precast techniques used worldwide and their adaptability to Sri Lanka. (Marks 07)

Q5.

(a) Tunnel boring machines (TBMs) are widely used worldwide for driving tunnels through both soil and rock, and were recently used in Uma Oya Hydropower project in Sri Lanka. Briefly explain the advantages and disadvantages of using TBMs in Sri Lankan Construction industry. (Marks 07)

(b) There are many uses of Cofferdams. It is an essential tool for any project that requires diverting of water flow. Briefly explain what a cofferdam is and the types of cofferdams used in Sri Lanka. (Marks 06)

(c) Motivation levels within the workplace have a direct impact on employee productivity. Workers who are motivated and excited about their jobs carry out their responsibilities to the best of their ability, and productivity increases as a result. Explain techniques that can be applied to motivate construction workers to optimise the productivity in Sri Lankan construction sites. (Marks 06)

(d) Briefly explain different semi financial incentives and financial incentive schemes used in construction industry supporting your answers with examples.

(Marks 06)

Q6. The Table shown below gives a breakdown of activities associated with a building project. Also it depicts the precedence relations and durations of each activity.

Symbol	Activity	Immediate predecessors	Durations days
A	Mobilization		3
B	Excavation	A	4
C	Concreting	B	2
D	Erect Frames	C	4
E	Lay brick work	D	6
F	Install basement drains	C	1
G	Concrete basement floor	F	2
H	Roof plumbing	F	3
I	Roof wiring	D	2
J	Heating and ventilation	D,G	4
K	Fasten plaster board	I, J,H	10
L	Lay flooring	K	3
M	Fixed kitchen fixtures	L	1
N	Finish plumbing	L	2
O	Finish carpentry	L	3
P	Finish roofing	E	2
Q	Finish gutters	P	1
R	Lay storm drains	C	1
S	Sand and varnish flooring	O,T	2
T	Paint	M,N	3
U	Finish electrical work	T	1
V	Finish grading	Q, R	2
W	Landscaping	V	5

Draw the activity on arrow network diagram of this project, carry out the forward pass and backward pass on this network and indicate the critical path. (Marks 12)

(a) Explain the situations where different types of dummy activities are used. (Marks 04)

(b) Name three types of floats used in Critical Path Method and compute these for activities C and K. (Marks 03)

(d) Explain the purpose of the following two operations emphasising how they would be carried out;

Resource scheduling

Resource smoothening (Marks 06)