

UNIVERSITY OF BOLTON

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE

BENG (HONS) CIVIL ENGINEERING

SEMESTER ONE EXAMINATION 2023/24

CONSTRUCTION MANAGEMENT AND DIGITAL SKILLS

MODULE NO. CIE5014

Date: Saturday 13 January 2024

Time: 10:00 AM – 12:00 PM

INSTRUCTIONS TO CANDIDATES:

There are **FOUR** questions in this paper.

All questions carry equal marks.

Answer **ALL** questions.

Marks for parts of questions are shown in brackets.

All working must be shown. A numerical solution to a question obtained by programming an electronic calculator will not be accepted.

This examination paper carries a total of 100 marks.

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Question 1

- a) Explain the factors that affect the cost of owning an operation plant.
 (12 marks)

- b) For a University Project in Dubai, it is required to carry out an excavation of a depth of 7m below ground level. The excavation has a bottom cross-section measuring 25m x 50m and a top cross-section measuring 30m x 60m, with sides sloping back at a 45° angle to the horizontal. The soil composition at the site is a combination of sand and gravel. A dragline with a 1.25m³ bucket is selected to carry out the excavation. This dragline has a working output of 150m³ (loose) per hour when operating in sand and gravel. The equipment can be hired at an hourly rate of AED 225. The manpower requirement for this excavation operation and their hourly rates are summarized in **Table Q1 (b)**. Determine the total cost of the excavation and the cost per m³ for this project.
 (13 marks)

Table Q1(b)

| Man Power | Hourly Rates |
|-------------------|--------------|
| Dragline Operator | AED 42.50 |
| Mechanic Fitter | AED 32.50 |
| Banksman | AED 30.00 |
| Labourer | AED 30.00 |

Total 25 marks

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Question 2

a) Al Sham Construction Company in Ras Al Khaimah is aiming to win a contract for a new development project. The client has issued a request for proposals to various contractors, including this company. To submit a competitive bid, the construction firm needs to go through a detailed tender preparation process to make sure their proposal meets the client's requirements and is also financially viable for their business. Illustrate the sequence of actions that the contractor must follow in creating a bid through a flowchart.

(13 Marks)

b) The construction sector has the potential to save hundreds of millions of pounds annually by implementing improved waste management practices. Contractors in the industry are increasingly examining ways to decrease waste on sites and considering recycling options more thoroughly.

(i) Outline any Six common causes of materials waste in construction sites.
(6 Marks)

(ii) Analyse how the '**Quality Control process**' may improve the control of materials wastage and thus reduce the amount of money lost in a project.

(6 marks)

Total 25 marks

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Question 3

a) You have been hired as a project manager for a major bridge construction project that is vital for the transportation network of a growing city. As you begin planning and managing this complex project, you need to decide on the best project management approach. Two common methods are CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique). Describe the key differences between the CPM and PERT.

(5 marks)

b) Perform the forward and backward pass method of calculation for **Table Q3 (b)**, and complete the following tasks:

i) Draw the network diagram connecting each activity. Use AON (Activity-on-Node) method.

(5 marks)

ii) Calculate the earliest start time, earliest finish time, Latest start time and Latest finish time for each activity.

(10 marks)

iii) Determine the critical path, expected project completion time and calculate total float for each activity.

(5 marks)

Question 3 continued over...

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Question 3 continued...

Table Q3 (b)

| Activity | Predecessor | Duration (week) |
|----------|-------------|--------------------|
| A | - | 5 |
| B | A | 7 |
| C | A | 4 |
| D | B | 10 |
| E | C | 3 |
| F | C | 5 |
| G | D, E | 6 |
| H | F, G | 4 |

Total 25 marks

Question 4

- a) **Table Q4 (a)** gives data on normal time, normal cost, crash time and crash cost for a project.

**Question 4 continued over...
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Question 4 continued...

Table Q4 (a)

| Activity | Normal time (Weeks) | Normal cost (AED) | Crash time (weeks) | Crash cost (AED) |
|----------|---------------------|-------------------|--------------------|------------------|
| 1-2 | 5 | 3000 | 4 | 4000 |
| 2-3 | 6 | 1200 | 2 | 2000 |
| 2-5 | 4 | 1000 | 3 | 1800 |
| 2-4 | 5 | 1200 | 3 | 2000 |
| 5-6 | 3 | 1600 | 3 | 1600 |

i) Draw the network and identify the critical path.

(5 marks)

ii) If indirect cost is AED. 300 per day. Determine the Optimum cost and minimum duration.

(15 marks)

b) A housing project comprises multiple houses where the same construction tasks—such as laying foundations, brickwork, roof construction, and internal trades—are carried out on each house and scheduled using the Line of Balance method. What are the steps involved in this construction scheduling approach?

(5 marks)

Total 25 marks

END OF QUESTIONS