UNIVERSITY OF GREATER MANCHESTER

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE, RAS AL KHAIMAH

BENG (HONS) CIVIL ENGINEERING

SEMESTER TWO EXAMINATION 2024/2025

CONSTRUCTION MANAGEMENT AND DIGITAL SKILLS

MODULE NO: CIE5014

Date: Saturday, 17 May 2025 **Time: 10:00 am – 12:00 pm**

INSTRUCTIONS TO CANDIDATES:

There are FOUR (4) questions in this paper.

All questions carry equal marks.

Answer ANY THREE (3) questions.

Marks for parts of questions are shown in brackets.

All work 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 75 marks.

Pages 6 and 7 should be attached with the answer script.

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QUESTION 1

a) You are a site engineer working on a mid-rise residential building project in Ras Al Khaimah. The client, Modern Developers, requires all contractors to comply with RAK Barjeel's sustainability regulations, including proper waste management practices. Based on this scenario, identify and describe the potential factors that lead to material wastage in your project.

(12 marks)

b) Under RAK Barjeel's sustainability goals, waste management plays a vital role during both the construction and operational phases of a building project. Briefly explain the expected compliance requirements and practical guidelines needed for construction and operational waste management under this code.

(13 marks)

[TOTAL 25 MARKS]

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QUESTION 2

A maintenance team has been tasked with renovating a residential apartment. The client expects the project to be delivered on time and at the minimum possible cost. The project consists of several interrelated activities, shown in **Table 1**, which lists the durations and direct costs under normal and crashed conditions. The indirect cost is 80.00 AED per day.

a) Draw the network diagram, calculate the normal completion time, and determine the total normal cost of the project.

(4 marks)

b) Crash the project systematically to find the optimal project duration and minimum project cost.

(17 marks)

Table 1

Activity	Normal		Crash	
	Duration (Days)	Cost (AED)	Duration (Days)	Cost (AED)
1-2	6	400	4	520
1-3	7	600	4	720
2-4	5	300	3	380
3-4	6	250	4	310
3-5	8	350	5	480
4-5	4	200	2	300

c) Explain the Critical Path Method (CPM) and its usefulness in managing project schedules.

(4 marks)

[TOTAL 25 MARKS]
Please turn the page

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QUESTION 3

a) A construction company is planning to bid for a new project. To prepare a strong proposal, the company must follow a structured tendering process. Draw a flowchart showing the steps involved in preparing and submitting a construction tender.

(10 marks)

b) For a villa construction project in Al-Jazeerah, excavation is required to a depth of 6.5 meters below ground level. The base of the excavation measures 27 meters by 45 meters, and due to the presence of clay and silt in the soil, the sides are designed to be sloped at an angle of 45 degrees to the horizontal to ensure stability. A dragline excavator fitted with a 1.75 m³ bucket has been selected for the job. In these soil conditions, the machine has a working output of 140 m³ (loose volume) per hour and can be rented at an hourly rate of AED 280. In addition to equipment costs, the excavation process will also involve manpower, including operators and support staff, each with specific hourly rates as summarized in **Table 2**. Based on this information, determine the total cost of the excavation, including equipment and labour.

(15 marks)

Table 2

Manpower	**Hourly Rates**
Dragline Operator	AED 40.50
Mechanic Fitter	AED 32.00
Banksman	AED 28.50
Labourer	AED 30.00

[TOTAL 25 MARKS]

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QUESTION 4

Table 3 provides the sequence of activities required to fit out 15 retail shop units in a new shopping mall. The table outlines the optimum crew sizes and total man-hours required for each activity based on the contractor's method statement.

Table 3

Activity	**Man-hours per activity (per unit)**	**Optimum gang size per activity (per unit)**
A - Partition Framing	160	2
B - Plastering	235	3
C - Tiling	410	4
D - HVAC Installation	330	2

The contractor works Monday through Friday, eight hours per day, with a target production rate of 3 shop units per week. A 3-day buffer is required for safety and inspection, and all activities must be performed in sequential order.

a) Complete the Line of Balance **CALCULATION SHEET** provided on **Pages 6 and 7** for activities A to D, showing all working.

(15 marks)

b) Using the data calculated, develop a fully annotated **Line of Balance schedule** on the graph paper provided (landscape orientation). Clearly state the minimum completion time for the entire project.

(10 marks)

[TOTAL 25 MARKS]

END OF QUESTIONS

PLEASE TURN THE PAGE FOR CALCULATION SHEET

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CALCULATION SHEET - ATTACH ALONG WITH ANSWER SHEET

LINE OF BALANCE CALCULATION SHEET

PROJECT: ……

(Minimum Buffer Time Selected: …….. days) Prepared by: …….. Date: ……..

Activity	Man Hours per Unit	Hand over rate/week	Total Man Hours/week	Number of Men				Actual Rate of Construction	Duration for one unit	Actual duration of work	Calculation of Start and Finish Dates	Summary			
				Planned / 40	Optimum gang Size	No of Gangs to be used	Actual No of Men used					First Unit		Last Unit	
												Start	Finish	Start	Finish

Calculation sheet continued over the page…

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Calculation sheet continued…

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