UNIVERSITY OF BOLTON

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE

BENG (HONS) CIVIL ENGINEERING

SEMESTER ONE EXAMINATIONS 2022/2023

CONSTRUCTION MANAGEMENT AND DIGITAL SKILLS

MODULE NO. CIE5014

Date: Wednesday, 11 January 2023   **Time: 10:00 – 12:00**

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.

Pages 7 to 9 should be attached with the answer script

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Q1.

a) What entities should be considered when calculating the net cost of a pretender document?

(10 marks)

b) As a part of the substructure work for a University Project in Ras Al Khaimah, it is required to carry out an excavation of depth 8m below ground level. The bottom cross-of the excavation is 35m x 70m with sides battered back 45° to the horizontal. The soil in the site is a mix of sand and gravel. It is decided that for the excavation operation, a dragline with a $1.20m^3$ bucket and a working output of $160m^3$ (loose) per hour in sand and gravel is to be used. The hiring rate for this equipment is AED 220 per hour. The manpower required for this excavation operation and their hourly rates are summarized in **Table Q1(b).** Determine the total cost and cost per m^3.

(15 marks)

Table Q1(b)

Man Power	Hourly Rates
Dragline Operator	AED 43.50
Mechanic Fitter	AED 35.50
Banksman	AED 32.00
Labourer	AED 32.00

Total 25 marks

PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
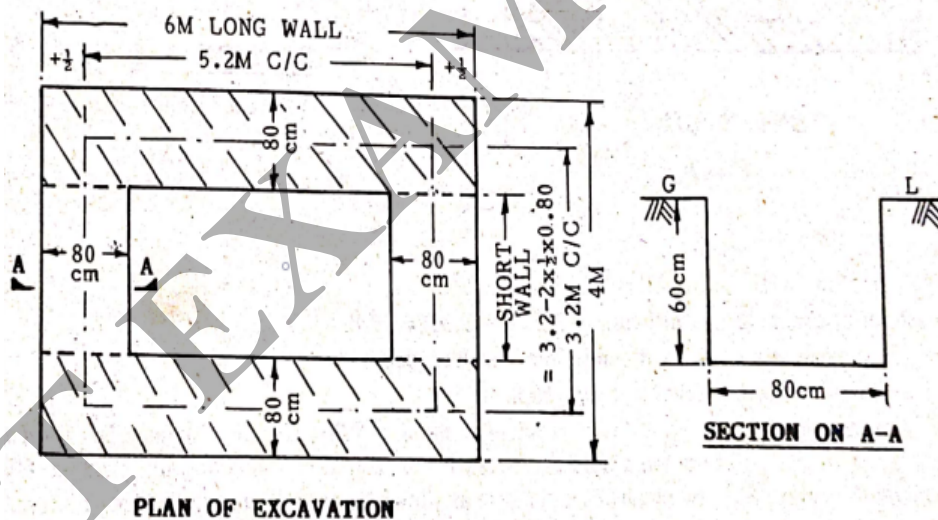Construction Management and Digital Skills
Module No. CIE5014

Q2.

a) Barjeel is the new Green Building Regulations of Ras Al Khaimah. One of the goals of Barjeel Code is the 'Promotion of sustainable building materials and reduction of waste'. Briefly explain the requirements, guidelines and submission stage evidences of both Construction and Operational waste management.

(15 marks)

b) **Figure Q2(b)** represents plan and section of a trench which is 80cm wide and 60cm deep. Calculate the volume of Earthwork for the trench using Long and Short Wall Method.
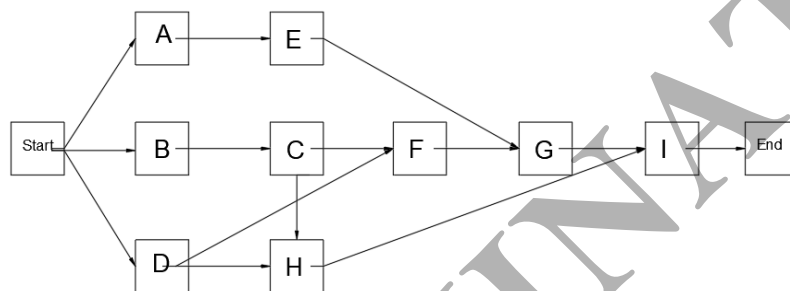
(10 marks)

FIGURE Q2(b)

Total 25 marks

PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Q3.

a) A network program in **Figure Q3 (a)** is set out for the construction of a building project. The client requires information on the optimum duration (least cost) of the project. The details in **Table Q3 (a)** list the duration and direct cost for each activity under both normal and crashed conditions. Assume the indirect cost per day as **£** 900.00

Figure Q3 (a)

(i) Identify the Critical path in the network and the duration of the project.

(3 marks)

(ii) Calculate the cost slope for each activity and indicate its ranking

(5 marks)

(iii) Establish the minimum cost of the project

(12 marks)

Q3 continues over the page

PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Q3 continued

Table Q3 (a)

Activity	Normal		Crash	
	Duration (days)	**Cost (£)**	**Duration (days)**	**Cost (£)**
A	6	2,500	5	3,100
B	10	7,000	7	8,200
C	6	6,500	5	7,000
D	12	10,000	10	11,800
E	12	4,200	9	5,700
F	6	8,200	5	8,500
G	5	5,200	4	6,000
H	8	7,500	5	8,700
I	4	5,600	3	6,000

b) Evaluate the method of communication employed in the construction industry and state its advantages and disadvantages.

(5 marks)

Total 25 marks

PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Q4.

The information tabulated in **Table Q4** details the sequence of activities for each of the 20 units to be constructed for an industrial estate project. Optimum gang sizes and total man-hours per activity for each unit are extracted from the contractor's method statement. The contractor's normal working week is Monday to Friday, eight hours per day, and the target rate of completed construction is 3 units per week. A minimum 5-day buffer time is considered appropriate for this project and it is assumed that all operations are sequential.

Table Q4

Activity	Man-hours per activity (per unit)	Optimum gang size per activity (per unit)
A-Substructure	110	3
B-Superstructure	320	8
C-Joinery	365	9
D-Plumbing	35	2
E-Finishes	210	5

a)   Complete the line of balance calculation sheet provided in **Table Q4 (a)** for activities A to E inclusive.

(15 marks)

b)   Produce a fully annotated Line of Balance Schedule on the graph paper provided (use landscape orientation) and state the minimum duration for completion of the industrial estate project.

(10 Marks)

Total 25 marks

END OF QUESTIONS

Please turn the Page for Table Q4 (a)

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Table Q4 (a)

LINE OF BALANCE CALCULATION SHEET

PROJECT : .... OF ....

(Minimum Buffer Time Selected : ....days)   Prepared By : ....   Date : ....

PLANNED INFORMATION

* Activity Ref & Descⁿ	Man Hours per Unit	Hand over rate/ week	Total Man Hours /week	Number of Men			Dur for Dur one used	Calculation of Start and Finish Dates			
			Plan-ned ÷ 40 hr/wk	Opti-mum Gangs Gang to be Size used	No of used	Actual No of Men used	Actual Rate of Const Unit	*	First Unit Start / Finish	Last Unit Start / Finish

CALCULATED INFORMATION

* Summary	First Unit		Last Unit	
	Start	Finish	Start	Finish

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PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Table Q4 (a) cont'd

LINE OF BALANCE CALCULATION SHEET

PROJECT : .... OF ....
(Minimum Buffer Time Selected : ....days)   Prepared By : ....   Date : ....

		PLANNED INFORMATION						CALCULATED INFORMATION				
Activity Ref & Desc" *	Man Hours per Unit	Hand over rate/ week	Total Man Hours /week	Number of Men				Dur for Dur one Unit used *	Calculation of Start and Finish Dates	* Summary		
			Plan-ned÷ 40 hr/wk	Opti-mum Gangs to be used	No of Gang Size used	Actual No of Men used	Actual Rate of Const Unit			First Unit		Last Unit
										Start	Finish	Start	Finish
[Notes/Calcs]													
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PLEASE TURN THE PAGE

University of Bolton
Off Campus Division, Western International College
BEng(Hons) Civil Engineering
Semester 1 Examination 2022/2023
Construction Management and Digital Skills
Module No. CIE5014

Table Q4(a) cont'd

LINE OF BALANCE CALCULATION SHEET									
PROJECT : .... OF									
(Minimum Buffer Time Selected : ....days)			Prepared By :				Date :		
PLANNED INFORMATION						CALCULATED INFORMATION			
Activity Ref & Desc" *	Man Hours per Unit	Hand over rate/ week	Total Man Hours /week	Number of Men		Dur for one Unit *	Calculation of Start and Finish Dates		
				Opti-mum Gangs to be used	No of Actual No of Men used	Actual Rate of Const Unit Dur used		* Summary	
			Plan-ned÷ 40 hr/wk Gang Size used					First Unit	Last Unit
								Start / Finish	Start / Finish
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