Version Paper_4D16_2015

EGT3
ENGINEERING TRIPOS PART IIB / ENGINEERING TRIPOS PART IIA

Tuesday 5 May 2015 14.00 to 15.30

Module 4D16

CONSTRUCTION MANAGEMENT

*Answer not more than **three** questions.*

All questions carry the same number of marks.

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

*Write your candidate number **not** your name on the cover sheet.*

STATIONERY REQUIREMENTS
Single-sided script paper

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM
CUED approved calculator allowed
Attachment: 4D16 data sheet (1 page)
Engineering Data Book

10 minutes reading time is allowed for this paper.

You may not start to read the questions printed on the subsequent pages of this question paper until instructed to do so.

1 (a) Give the definition of the following terms: Free Float, Total Float, Lag and Critical Path. [20%]

(b) Use the project activities information provided in the table below to draw their Activity-on-Node (A-on-N) diagram. Perform forward and backward pass calculations in order to determine for each activity the early start time, early finish time, late start time, late finish time, total float and free float. Indicate which activities belong to the critical path. [40%]

Activity No.	**Duration (days)**	**Predecessor Activities / Relationships**	**Resource Demands (Common Labourers)**
1	3	-	3
2	4	-	2
3	2	1FS	3
4	2	3FF+3	2
5	1	3FS	4
6	2	2FS; 3SS+1	2
7	2	4FS; 5FS	3
8	3	6FS+2	2

where FS = Finish to Start; FF = Finish to Finish; SS = Start to Start

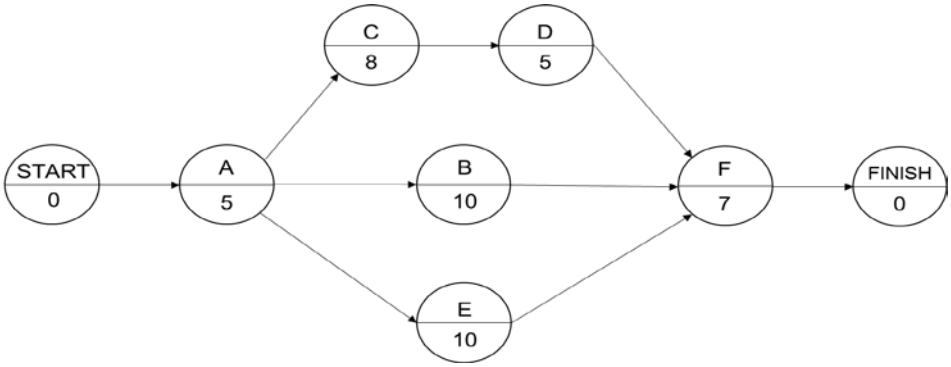
(c) Perform resource levelling for the above project in order to calculate the minimum possible daily demands for labourers. [40%]

2 (a) What is a cash flow analysis? Provide two reasons for conducting it. [15%]

(b) The equipment used on a project can be owned or it can be leased or rented from another company. It is also common that construction firms set up a "separate company", in an accounting sense, for the company-owned equipment. How does the ownership status affect the cash flow of a project? Comment on three types of ownership. [15%]

(c) If a construction activity that involves the use of heavy equipment faces delays and the construction company uses company-owned equipment, what is the impact on the cash flow? [20%]

(d) The cost and schedule data for a small project are given below. Assume an indirect cost of £200/day. Determine the minimum overall cost of the project and its associated duration. [50%]



Activities	Cost		Duration (days)	
	Crash	Normal	Crash	Normal
A	£4000	£3600	3	5
B	£6400	£5500	7	10
C	£6900	£6300	7	8
D	£4900	£4700	3	5
E	£2400	£2050	8	10
F	£1400	£1200	6	7

3 (a) What are the main aims of a good procurement strategy? List three factors that influence clients when choosing a specific procurement route. [15%]

(b) Describe the main features of the Design & Build procurement route using a diagram to show the relationships between the key parties. What are the advantages and disadvantages of choosing this route from (i) a client's and (ii) a contractor's point of view? [35%]

(c) Provide and explain four reasons why a contractor might decide to bid on a project other than profit. [15%]

(d) Estimate the optimum markup for a new project. The direct cost is estimated to be £2 million. Past cost estimates and actual costs of previous projects are shown in Table 1 to help you identify how accurate your estimates are and how to correct the new one for bidding purposes. One known competitor and two unknown competitors are expected. The data for the known competitor are shown in Table 2. [35%]

Project No.	Estimated cost (£)	Actual cost (£)
1	1,300,000	1,000,000
2	2,200,000	2,400,000
3	600,000	1,000,000
4	4,500,000	4,700,000
5	3,400,000	3,700,000
6	8,400,000	7,800,000
7	3,600,000	3,000,000

Table 1 Past cost estimates and actual costs of previous projects.

R	Number of times
$R < 1.00$	0
$1.00 < R \leq 1.02$	1
$1.02 < R \leq 1.04$	3
$1.04 < R \leq 1.06$	5
$1.06 < R \leq 1.08$	10
$1.08 < R \leq 1.10$	7
$1.10 < R \leq 1.12$	3
$1.12 < R \leq 1.14$	1

where R = bid price of competitor over estimated cost

Table 2 Bidding history of the known competitor

4 (a) Why should we care about Health and Safety in construction? [20%]

(b) How is Health and Safety regulated in the UK? What is the role of the HSE in the UK? [10%]

(c) What are the main requirements for the Management of H&S Regulations (1999) for employers? [20%]

(d) What are the duties of the client and the principal contractor under the CDM Regulations (2007)? [30%]

(e) What is the difference between the Risk Assessment and the Method Statement? [20%]

5 (a) Briefly describe the two main parts of Company Law. Which model of corporate governance do companies follow in the UK and what are the main features of this model? [30%]

(b) What are the main business types in the UK and how do they differ in terms of tax implications? [30%]

(c) What should the Statutory Accounts for companies include? [20%]

(d) What is Construction Economics concerned with? What is the difference between accounting cost and economic cost? [20%]

END OF PAPER

List of numerical answers

Q1(b)(i) & (ii) Critical paths: 1-3-6-8 & 2-6-8

Q2(d) Minimum overall cost: £28,150

Q3(d) Markup = £0.08 million