

National Exams May 2019

07-Bld-A3, Construction Engineering

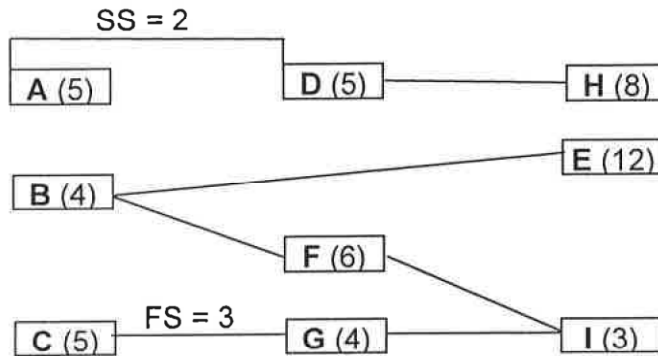
3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made;
2. This is a "Closed Book" exam. Candidates may use one of two calculators, the Casio or the Sharp approved models;
3. Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.
4. All questions are of equal value.

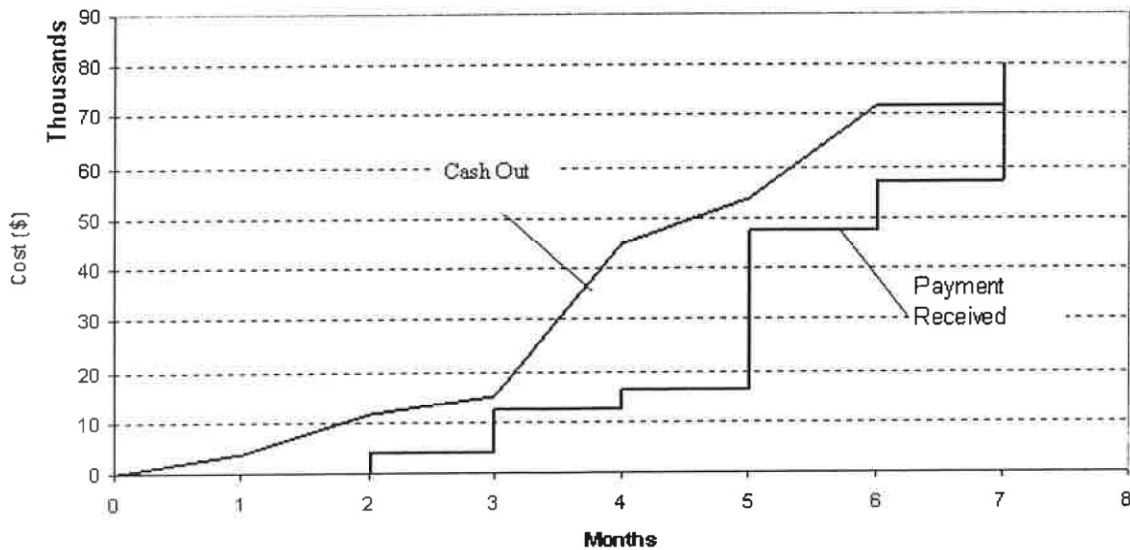
Question 1 (20 marks):

Perform CPM calculations for the following network and define the critical path. Draw a Late Bar Chart. What is the effect of delaying activity F by five days?



Question 2 (20 marks):

- (a) Sketch and briefly explain the general trend of a typical S-Curve.
- (b) The cash flow diagram for a small project is shown. Estimate the amount of interest charged on borrowed money using an interest rate of 1.5% per month. Also, Estimate the highest amount of cash needed. Briefly discuss three measures to reduce interest charges.



Question 3 (20 marks): Multiple choice questions

Drawback of cost-plus-fixed-percentage contracts:

- A Too much competition
- B Risk is too high for the contractor
- C Contractor has no incentive to save money
- D Deadline is too short

As compared to phased construction, in fast-track projects:

- A Project duration is larger
- B Project has one phase
- C Design overlaps construction in each phase

Key benefit of Turn-Key contracts:

- A Easier implementation of changes
- B Quality satisfies owner requirements
- C Cost is less than traditional delivery

Which contract form has less flexibility to accommodate design changes?

- A Lump Sum
- B Turn-Key
- C PCM

Which statement is correct about construction industry:

- A R&D expenditures are high
- B Projects are getting more complex and more demanding
- C Productivity is higher than manufacturing
- D Very small business failures

What are the Measures that help owners reduce project execution risk?

- A Performance bond
- B Retention amount
- C Careful selection of contractors
- D All of the above

Why is a WBS needed?

- A To suit our OBS needs.
- B To facilitate work packaging and estimating.
- C To perform forward pass calculations.
- D To draw the Bar Chart.

Select all TRUE statements about Unit price and lump sum contracts:

- A They are Cost-Plus Contracts
- B They are types of Competitive Bidding Contracts
- C They are favored to save taxpayers' money
- D They are equivalent to each other

One disadvantage of Turn-Key contracts:

- A Costs 25% more and quality is not guaranteed
- B Requires too much owner involvement
- C Is too risky for the owner
- D Applies to low-tech jobs

What is MERX?

- A Forms of international contracts
- B The set of local by-laws
- C A web depository of calls for bidders

An Addenda is needed to:

- A Keep all bidders informed of all Q/As
- B Notify the winning contractor
- C Issue Change Orders

In Lane-Rental contracts:

- A Contractor's risk is low
- B Contractor has strong incentive to finish the project fast
- C Projects are not time critical

Secondary site investigation is by whom and for what?

- A Designers, to get soil profile
- B Bidders, to do a detailed bid estimate
- C Designers, to know local by-laws

Which contract clause is NOT permissible?

- A Liquidated damages
- B Penalty only without incentive
- C Penalty and Incentives

Contractor prequalification documents include:

- A Financial situation
- B Past & current projects
- C Equipment owned
- D All of the above

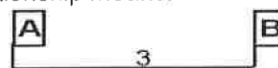
Critical activity is one that:

- A Lies on the longest path in the network
- B Has negative total float
- C Has positive total float



- A This is a critical task
- B It's a Non-Critical Task with ES = 1 and EF = 11
- C Total float is only 4 days because it is delayed 2 days

This relationship means:



- A The start of B is after the finish of A by 3 days.
- B B is predecessor to A.
- C Lag time of B is 3 days.

What does HDD stand for ?

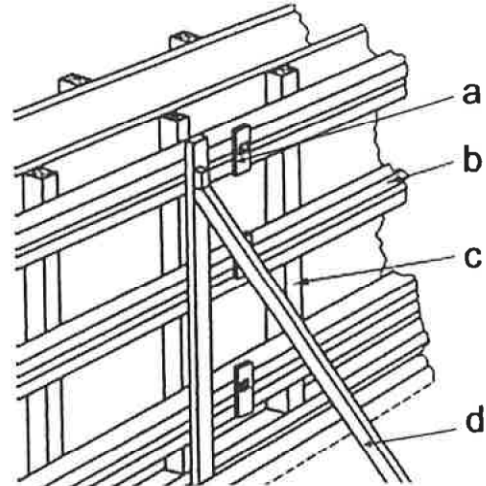
- A Horizontal Dangerous Drilling
- B Horizontal Directional Drilling
- C Hidden Datum Drilling

Select the TRUE statement:

- A Delaying a non-critical activity decreases its total float
- B To meet deadline we should speed non-critical tasks
- C Fast construction methods are cheaper than slow ones

Question 4 (20 marks):

Discuss the shown components of a wall form and briefly explain the formwork design process.



Question 5 (20 marks):

Discuss the need for and possible methods for deep excavation protection. Also, briefly explain the construction of: Concrete Slurry Walls; and Solider Piles and Wood lagging.

Question 6 (20 marks):

Discuss the Line-Of-Balance scheduling method and its pros and cons as compared to CPM scheduling method. Draw a schematic LOB chart for a 10-floor high-rise building, with each floor having four sequential tasks A, B, C, and D (each is 2 days duration), where the tasks' rates of delivery speeds (floors per day) are: 1, 2, 1, 0.5, respectively.

Question 7 (20 marks):

The average load volumes as a function of load time for a scraper are given below. The scraper's total cycle time minus load time is 3.0 min. Find the scraper's optimum load time that maximizes production. Use a 50 minute/hour efficiency factor.

Load time (min.)	Average load (CY)
0.2	11.4
0.4	18.7
0.6	22.7
0.8	24.8
1.0	26.1
1.2	26.8
1.4	27.2