National Exams May 2018

## 07-Str-B2, Management of Construction

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 (20 marks).

1. Scheduling:

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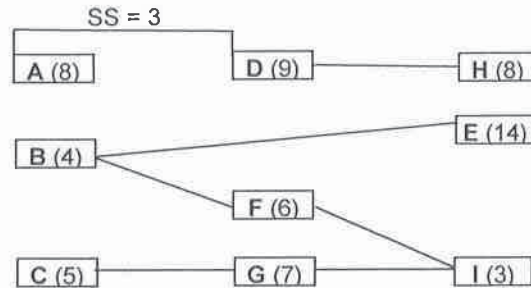

2. Estimating:

A building foundation has the provided plan and trench cross-section. Tasks are: Excavating trench; Concrete forms; and Concreting the footings (wall not included). The work is to be done as follows (8hrs / day):
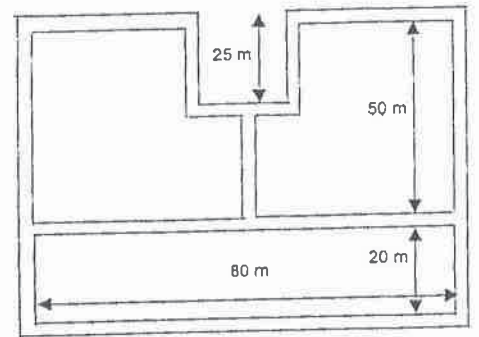
- Excavation uses a 0.29m³ backhoe;
- Formwork material can be used for two uses;
- Concrete production is 5m³ per hour;
- Concreting cost is $20,000 (includes material); and
- R.S. Means estimating data are given below.

Estimate the quantity, duration, and bare costs of: Excavation, Formwork, and Concrete.
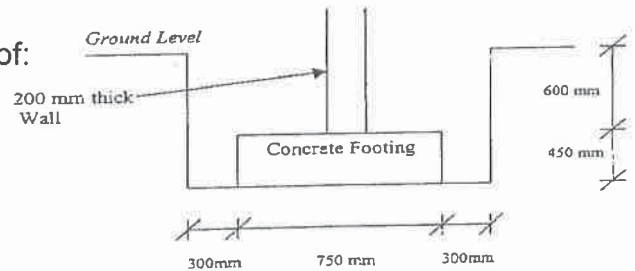
Task	Crew Daily OUTPUT	UNIT	BARE COSTS			
			MAT.	LABOR	EQUIP.	TOTAL
Trench Excavation						
0.3 m to 1.2 m deep, 0.29 m³ backhoe	115	m³		3.02	1.74	4.76
0.38 m³ backhoe	153			2.27	1.79	4.06
Forms in place, Footings Continuous Wall						
1 use	34.84	m²	12.8	21	.79	34.59
2 use	40.88		7	17.7	.67	25.37

3. Contract Administration:

Discuss the components of a bid package, the competitive bidding process, and the criteria used by public agencies to filter out unbalanced bids and select a winner.

4. Engineering Economics:

An appraisal of two alternative projects is being carried out. Given the following cash flow, calculate the most economical plan using present value profit. Use discount rate of 10% per year.

	Project A	Project B
Initial Investment	$170,000	$150,000
Yearly operating cost	$12,500	$11,000
Major Maintenance (every 5 years)	$15,000	$13,000
Yearly revenue	$23,500	$26,000
Life	15 years	10 years

5. Cash Flow:

(a) Sketch and briefly explain the typical BCWS curve for a project.

(b) Contractor's cash flow information for a small project is shown in the table. Each invoice is paid at the end of next month, after subtracting 5% retention amount. All retention amounts are paid back with last payment. Sketch the cash flow curves and estimate the amount of interest charged on borrowed money using an interest rate of 1% per month.

End of Month	Invoice (x $10,000)	Amount Received
1	$4	---
2	$11	?
3	$16	?
4	$46	?
5	$54	?
6	$71	?
7	---	?

6. Safety Practices and Regulations:

Briefly discuss each of the following safety measures and if it is suitable for a highway versus building projects, or both:

1 Fall protection | 5 Safety net
2 Scaffolding | 6 Respiratory equipment
3 Ladder safety | 7 First aid
4 Personal protective equipment (PPE) | 8 Welding safety