Lebanese American University
Department of Civil Engineering
CIE 485 – Construction Management
TEST 1 – Spring 2010

Date: April 07, 2010, 5:30 p.m.
Duration: 90 minutes

Name	
ID #	SOLUTION

NOTES:
The exam is closed book and notes
Assume any missing information that is necessary
Questions have weights as indicated
Do not unstaple the exam booklet
Exam booklet consists of 10 pages

Problem II (25%)

You are bidding a unit price contract with 3 pay items: Earthwork, Structural Steel, and Concrete. The engineer estimates that the quantities of the above pay items will be 25,000 CY, 200 Tons, and 600 CY respectively. Your initial estimates for the direct cost of the above pay items are 9$/CY, 310$/Ton, and 40$/CY respectively. Your project overhead on such projects is usually 30,000$. You wish to add 12% to your costs to recover G&A expenses and your net profit on this project.

7 a) Prepare a balanced unit price bid for this project showing all necessary calculations and the resulting total bid price submitted for this project.

5 b) Define unbalanced bidding and describe the different reasons why a contractor would submit an unbalanced bid for a project.

8 c) In what way would you unbalance this bid if you expect that the true (actual) quantity of the Concrete item is going to be 700 CY instead of 600 CY and you believe that the estimated quantities for the remaining items are almost accurate? Show all work. Compute the difference in profit you will make if your expectations turn out to be true.

5 d) Taking into consideration all the information provided above, show all calculations necessary to determine the total lump-sum bid price if you were to sign a *lumpsum* contract on this project.

Work Item	Unit	Quantity	Unit Direct Cost	Total Direct Cost	Bid Unit	Bid Total
Earth work	CY	25000	9	225,000	11.052	276,300
Structural Steel	Tons	200	310	62,000	380.68	76,136
Concrete	CY	600	40	24,000	49.12	29,472
			Total	311,000		381,908
			+ Proj. O.H	30,000		
				341,000		
			+ 12% G&A and Profit	40,920		
				381,920		

Total Bid Price

Burden Factor = $\frac{381,920}{311,000} = 1.228$

b) applies to unit-price contracts. Unbalanced bidding is to raise the unit prices of some bid items and proportionally decrease the prices on others so that the bid remains unaffected

⇒ front-end loading

⇒ assign fixed costs of pay items with uncertain quantities to prices of pay items with certain quantities

⇒ take advantage of expected mistakes in A/E's estimate

c) Increase unit price of concrete to 55 $/cy and decrease that of steel to 363 $/T such that:

	A/E's estimate	Balanced Unit Price	Unbalanced Unit price
Steel	200	380.68	363.04
Concrete	600	49.12	55
	Total	105,608	105,608

* If expectation turn out to be true:

If balanced bid, contractor will be paid:

$25{,}000 \times 11.052 + 200 \times 380.68 + 700 \times 49.12 = 386{,}820\$$

If unbalanced bid, contractor will be paid:

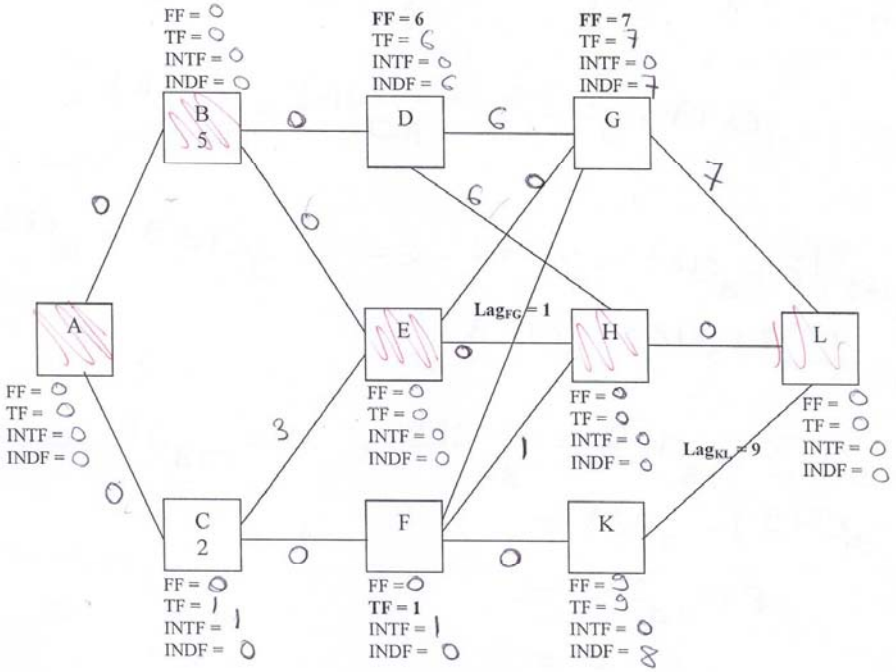
$25{,}000 \times 11.052 + 200 \times 363.04 + 700 \times 55 = 387{,}408\$$

⇒ Difference in Profit $= 387{,}408 - 386{,}820 = 588\$$

d) Bid Price $= \left[(25000 \times 9 + 200 \times 310 + 700 \times 40) + (30{,}000)\right] \times 1.12 = 386{,}400\$$

Problem IV (25%)

1) Consider an activity I with a predecessor H and a successor J. Define LAG_{IJ} and write the corresponding formula in function of the relevant activities' start and finish dates. Then, express free float (FF_I), total float (TF_I), interference float ($INTF_I$), and independent float ($INDF_I$) of activity I in function of LAG_{IJ} and other necessary floats.
2) For the precedence network shown below:
   a. Determine the missing link lags and show any necessary calculations. (The network indicates the durations for two activities B and C to be equal to 5 days and 2 days respectively)
   b. Determine the four floats as you defined them in part (1) for each activity.
   c. Identify the critical path.



1) $LAG_{IJ} = ESD_J - EFD_I$

$FF_I = \min_J (LAG_{IJ})$, $TF_I = \min_J (LAG_{IJ} + TF_J)$

$INTF_I = TF_I - FF_I$, $INDF_I = FF_I - \max(TF_H - LAG_{H:}$

(a)

$\Rightarrow$ B, C, D, F and K have only one predecessor so the links entering into these nodes have a lag of zero.

$\Rightarrow$ G and H have the same predecessors D, E and F

$$ESD_G = ESD_H = \max(EFD_D, EFD_E, EFD_F)$$

$$\Rightarrow LAG_{DG} = LAG_{DH} = ESD_G - EFD_D$$

$$\Rightarrow ESD_B = ESD_C \Rightarrow \left.\begin{aligned} EFD_B &= ESD_B + 5 \\ EFD_C &= ESD_C + 2 \end{aligned}\right\} EFD_B > EFD_C$$

$$\Rightarrow LAG_{BE} = 0, \quad LAG_{CE} = ESD_E - EFD_C$$
$$= ESD_E - (EFD_B - 3)$$
$$= LAG_{BE} + 3$$
$$= 3$$

(c) Critical Path : A, B, E, H, L