

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- VII<sup>th</sup> SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 170601****Date: 24/05/2012****Subject Name: Construction Management and Equipments****Time: 02:30 pm – 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**Q.1 (a)** Discuss objectives of construction management and Explain Planning, Scheduling and Controlling as a Function of Construction Management. **07**

**(b)** Explain the importance of equipments in construction industry and Discuss aspects of construction equipments that are required to be studied and mastered in order to accomplish cost effective and timely completion of construction projects. **07**

**Q.2 (a)** ( I ) State Rules for drawing network. Explain with suitable examples, errors in AOA networks( 03 ) **07**

( II ) A small project consists of twelve activities. Interrelationships amongst various activities are as follows:

- Activity A is starting activity and proceeds activities B,C and D.
- Activity E depends on activities B and C
- Activity F follows activities C and D.
- Activities G and H can start as soon as activity D is completed.
- Activity I succeeds activities G, E and F.
- Activities J and K can start only when activities H and I are completed.
- Activity L is the last activity and it succeeds activities J and K.
- Prepare dependency table and draw AOA diagram. ( 04 )

**(b)** ( I ) Briefly explain the concept of time value of money. ( 03 ) **07**

( II ) Compare two alternative available for using equipment on construction project site for project duration of 8 (eight) years.

Alternative A : Buy new equipment at first cost of Rs. 50,00,000/-with net annual return of Rs. 09,00,000/- and salvage value of @ 10 % of its first cost.

Alternative B : Buy second hand equipment at cost of Rs. 30,00,000/- with net annual return of Rs. 6,00,000/- and useful life of 4 (four) year with 0 (zero) salvage value.

Additional Information: At present market value of 4 (four) year old new equipment is @ 34,00,000/- and M.A.R.R. = 18 % ( 04 )

OR

**(b)** ( I ) Discuss the influence of combined variation of atmospheric temperature and pressure on the performance of I. C. engine. And Discuss Importance of rolling resistance for hauling equipments. ( 03 ) **07**

**Q.2 (b) (II)** For a wheel type tractor trailer combination following data is available.

- HP at MSL. = 300 Hp.
- Efficiency of engine = 90 %
- Gross weight = 35 T.
- Weight on driving wheel = 21 T.
- Gross weight of trailer = 12 T. ( empty )
- Gross weight of trailer = 32 T. ( Loaded )

Speed in various gears.

Gear	1	2	3	4	5	
Rated Speed	8.5	15.5	22.5	33.5	48.0	KMPH

Determine gradability in **FIRST GEAR ONLY** ( using only 80 % of spare rimpull ) for tractor + trailer ( Empty ) , tractor + trailer ( loaded ) when operating on road at altitude of 2000 m. having rolling resistance of 50.00 kg/ T. ( For tractor ) and 40.00 kg/ T. ( for trailer ) and Coefficient Of Traction ( COT ) = 0.33. ( 04 )

**Q.3 (a) (I)** Explain, Why time cost trade off is necessary? Discuss various ways to reduce the activity duration. (02) **07**

(II) For a small project following data is available.

I node for activity	1	1	2	3	4	4	4	5	6	7
J node for activity	2	3	3	4	5	6	7	7	7	8
Normal Duration	10	13	4	6	0	5	9	7	3	3
Crash Duration	9	10	3	4	0	4	7	5	3	2
Normal cost	1000	780	400	320	0	250	720	420	30	300
Crash cost	1200	900	470	410	0	300	810	580	30	400

Take indirect cost as Rs. 50 per day.

Determine

- (a) Normal Project duration and corresponding project cost.
- (b) Optimum Project cost and corresponding project duration.
- (c) Minimum project duration and corresponding project cost. ( 05 )

**(b) (I)** Explain importance of soil fundamentals related to swell, shrinkage etc. with reference to large scale earth excavation , moving and compaction projects. ( 02 ) **07**

(II) Estimate book value of equipment at the end of each year of ownership from following data:

- Initial book value of equipment = Rs. 25,00,000/-
- period of ownership = five years.
- Salvage value = Rs. 2,00,000/-
- method of depreciation = sinking fund method take  $i = 16\%$  ( 05 )

OR

**Q.3 (a) (I)** What are the objectives of resource allocation? Explain do you mean by resource leveling? Explain step by step process for resource leveling. ( 04 ) **07**

(II) Describe safety requirements for demolition works, safety requirements for scaffolding and form work. ( 03 )

**Q.3 (b) (I)** Discuss various costs parameters that are considered and analyzed in order to formulate equipment replacement policy. ( 04 ) **07**

( II ) For a civil engineering project net volume of earth fill is 2,50,000 m<sup>3</sup> (with moisture content of 16 % and dry unit weight of 1980 kg / m<sup>3</sup> ). This is to be done by excavating stiff clay borrow pit having 18 % moisture content and unit weight of undisturbed soil sample of 2100 kg / m<sup>3</sup> . Estimate total volume of borrow pit excavation and volume of water that will either required to be added or to be expelled in order to achieve design specifications. ( 03 )

**Q.4 (a) (I)** Differentiate between network diagram and time grid diagram. Discuss with suitable examples, use of time grid diagram to prepare resource schedule. ( 04 ) **07**

( II ) Explain meaning of cash flow analysis. Discuss purpose of cash flow analysis. Also differentiate between cash flow for contractor and cash flow for owner. ( 03 )

**(b) (I)** Explain job layout. Enlist and discuss factors to be considered for preparation of job layout. ( 03 ) **07**

( II ) Describe safety requirements for demolition works, and safety measures to be adopted for Excavation. ( 04 )

OR

**Q.4 (a) (I)** Explain the term “Updating”. Why updating is necessary? (02) **07**

( II ) Original schedule of a small project is given below and information at the end of tenth working day is also given. Determine change in critical path and project duration by updating the network.

Original Schedule:

Activity	A	B	C	D	E	F	G	H	I
Preceding Activity	-	-	A	A	B,C	B,C	D,E	D,E	F,G
Duration	5	7	8	5	3	4	2	3	5

Information at the end of tenth working day.

- Activities A and D were completed as per schedule.
- Activity B is completed in 5 days instead of planned 7 days
- Activity C started immediately after activity A was over. And it yet requires 5 more days.
- Considering site conditions duration of activities E and F are revised to 4 days and 5 days respectively.
- Duration of activities G, H and I are unchanged. (05)
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**(b)** Differentiate in very brief and precisely between **07**

- Building construction projects and infrastructure projects.
- Heavy construction works and industrial construction works
- Building construction works and Industrial construction works
- bar chart and Mile stone chart
- Optimistic time and pessimistic time
- Total float and free float
- Critical path and near critical path with reference to PERT

**Q.5 (a) (I)** Discuss various types of the blade available for bulldozer along with their specific usage and possible movement for maneuvering. ( 03 ) **07**

( II ) From following information determine the cost of production (excavation and hauling) in terms of Rupees per Cubic meter.

- Excavating equipment : Hoe with 1.33 m<sup>3</sup> dipper ( can handle 1.51 m<sup>3</sup>) having cycle time of 16 seconds and operating factor of 55 minute per hour . Cost Rs. 3500 per hour )
  - Material : good common earth with swell of 20 % and fill factor of 0.85.
  - Hauling Units : Trucks 8.5 m<sup>3</sup> (b.m.) capacity with operating factor of 50 minutes per hour and having round trip time 22 minutes. ( Cost Rs. 400 per hour.)
- ( 04 )

**(b) ( I )** Briefly explain the inter relationships amongst material to be excavated, bucket type, bucket size boom length and boom angle for safe and efficient drag line operations. ( 03 ) **07**

( II ) For construction equipment following information is available.

- Initial cost of acquisition Rs. 65,00, 000/-
- Cost of tyre sets Rs. 3,50,000/- to be replaced after every 3000 hours of operation.
- Cost of major overhaul and repairs Rs. 8,00,000/- to be carried out after every 4500 hours of operation.
- Cost of fuel, lubricants and minor repairs and maintenance Rs. 1100/- per hour
- Estimated Life of machine = 13500 Hours of operation.
- Estimated salvage value = 15 % of initial cost.
- Estimated usage of equipment = 1500 Hours per year

If MARR is 20 % per year estimate minimum hourly rental charges for equipment. ( 04 )

OR

**Q.5 (a)** Answer the following in very brief and precise way : **10**

1. Discuss the factors influencing the selection of suitable excavating equipment.
2. Explain, How output of power shovel can be improved.
3. Explain the factors influencing the output of Hoe
4. Discuss the factors influencing the selection of suitable excavating equipment.
5. Write brief notes on Front End Loader OR Earth and rock saws.

**(b)** Explain the functions of following components with reference to Belt conveyer System : belt, Feeders, Hold backs, Take ups **04**

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