

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2174002
Date: 19/11/2018
Subject Name: Construction Planning & Management
Time: 10:30 AM TO 01:00 PM
Total Marks: 70
Instructions:

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

MARKS

- Q.1 (a) Differentiate between logical dummy and numbering dummy in a CPM network with suitable example. 03
- (b) Activity i and j (duration d_i and d_j) are having following logical relationships: Start to Start, Start to Finish, Finish to Finish. Derive equations for calculating event times of Activities i & j . 04
- (c) Draw a CPM-AOA network for following project data and find out the floats available for all the activities 07

Activity	IPA	Duration (weeks)	Activity	IPA	Duration (weeks)
A	-	4	G	D	6
B	-	6	H	C, G	4
C	A	5	I	D	7
D	A, B	4	J	H, F, I	3
E	A	5	K	I	5
F	E	3	L	K	3

Draw the linked bar chart for the project data also.

- Q.2 (a) Briefly explain the situations where a numbering dummy is included in a CPM-AOA network. Support your explanation with a network sketch. 02
- (b) Draw the CPM-AON diagram and calculate the critical, total floats and free floats for the schedule shown below. 05

Activity	IPA	Duration (weeks)	Activity	IPA	Duration (weeks)
A	-	2	H	D	9
B	A	7	I	F, G	12
C	A	10	J	F	5
D	A	4	K	E, J	5
E	B	6	L	G, H	6
F	B, C	5	M	F, H	4
G	C, D	8	N	I, K, L, M	3

- (c) Draw a Late Start (LS) based resource histogram for the project data given in Q.1 (c) (07)
with following resource requirements

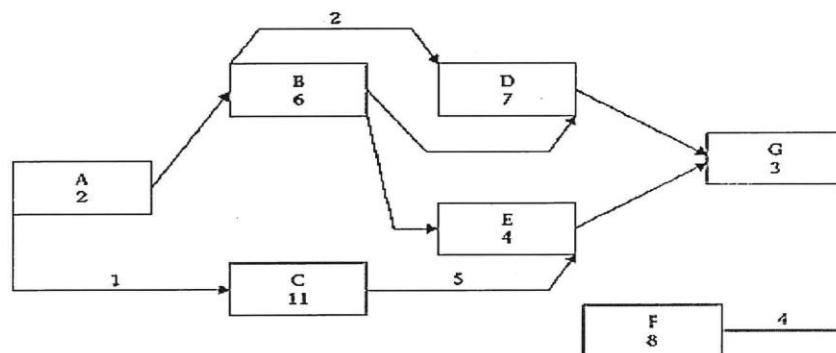
Activity	Total Resources (No)	Activity	Total Resources (No)
A	16	G	18
B	12	H	8
C	25	I	49
D	20	J	6
E	5	K	20
F	9	L	6

OR

- (c) Draw the AON diagram and perform the CPM network computations (including floats) for the schedule shown next. 07

Activity	IPA	Duration (weeks)	Lag
A	-	2	-
B	A	6	-
C	A	10	-
D	A	4	4
E	B	7	-
F	B, C	5	3
G	C, D	3	-
H	E, F	5	-
I	G, H	2	1

- Q.3 (a) The expected completion time for a project is 32 months with a variance of 7.6 months. 03
What is the probability that project will be completed in 30 months.
(b) Perform the forward and backward pass for the network shown below and calculate the activity times (ES, EF, LS & LF) 04



- (c) A contractor agreed to build 30 dog houses in 90 days at a price of Rs. 8000 per unit. Twenty days later, the contractor has finished 8 dog houses with an actual total cost (that includes his overhead and profit) of Rs. 68000. What is the status of the project? 07

OR

- Q.3 (a) Draw LOB Planning Diagram for following situations 03
Activity B is faster than Activity A

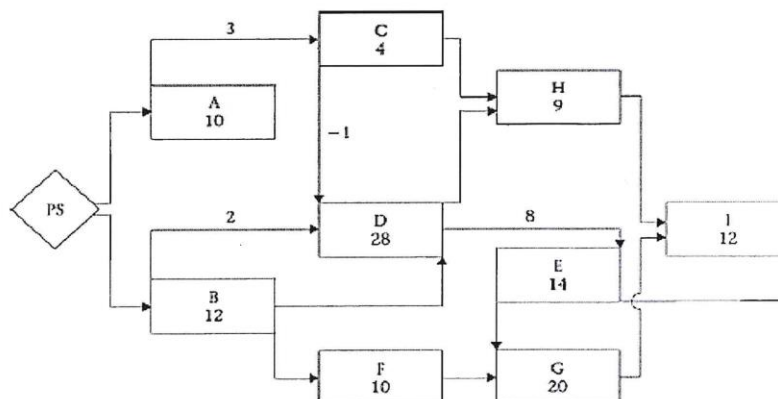
Activity D is faster than Activity C but both are to be completed together

- (b) Briefly explain Work Break Down Structure and its use in project management. Use sketch to explain different hierarchy in WBS 04
- (c) In Q. 2 (c), 10 days after the project has started, you receive the following report: 07
- Activities A and D are complete, actual dates: A (0, 2), D (5, 9).
 - Activity B started on day 5. Remaining duration: 2 days.
 - Activity C started on day 2. Some problems were encountered. Remaining duration 4 days.
 - The duration for activity F was adjusted to 8 days.
 - Activity J has been canceled.
 - The duration for new activity P is 4 days. New logical relations: New IPA: E and F. Immediately succeeding activity) is K.
 - Update the network diagram.
- Q.4 (a) Briefly explain how direct cost and indirect cost of a project vary with project completion time. How activities are prioritized/selected for crashing? 03
- (b) Draw the network for the following project. 04

Activity	IPA	Duration (Days)		
		Optimistic (To)	Most Likely (Tm)	Pessimistic (Tp)
A	-	4	5	6
B	A	10	12	14
C	A	7	9	16
D	B	14	17	22
E	B, C	10	15	30
F	C	4	7	13
G	D	12	20	40
H	D, E	10	12	15
I	F, H	8	9	10

Compare the three paths: ABDHI, ABDG, and ABEHI. Calculate the Expected Duration and Standard Deviation for each path. Considering all three paths, what is the duration of the project with at least 95% confidence?

- (c) Perform the forward and backward passes on the precedence network shown in Figure below. 07



OR

- Q.4 (a) Draw the status bar chart (linked) of the above project data (Q.4b) at the end of 12 weeks. Activity A, B, C are completed, C is 50% completed. 03
- (b) Activity details of a construction project are given below. Complete the following scheduling tasks: 04

Activity	IPA	Duration (Weeks)	Cost (Rs)
A	-	4	4000
B	-	5	20000
C	A	3	6000
D	A	2	10000
E	B, C	6	9000
F	A	8	8000
G	D, E	3	6000
H	B, C	2	10000

Calculate the cash flow requirement for first 10 weeks if the project is scheduled as per early start of activities (ES Schedule).

- (c) Following data is available for a project. Find out the expected completion time of the project along with its standard deviation. What is the probability that the project will be completed in 19 months? 07

Activity (i-j)	Expected Time (Months)	Variance
1-2	4	1
2-3	2	1
2-6	3	1
2-4	6	2
1-5	2	1
5-6	5	1
4-6	9	5
5-7	7	8
7-8	10	4
6-8	1	1

- Q.5 (a) How resource leveling is different from resource allocation? 03
- (b) Enlist the steps/rules involved in the resource smoothening/leveling process in project planning/scheduling. 04
- (c) A real estate villa project of 15 houses involves 7 operations (A, B, C, D, E, F, G) in series with duration and other resource requirements are as given below. Using Line of Balance (LOB) concept, schedule the project. Use a minimum buffer of 0.5 weeks between operations. 07

Operation	Duration for one house (Weeks)	Labor Required (Number of Gangs)
A	2	1
B	5	2
C	4	1
D	1	2
E	6	4
F	4	1
G	2	2

OR

- Q.5 (a) State the suitability of Line of Balance (LOB) method as a construction project scheduling tool. 03
- (b) A 10 story building construction involves 4 operations (A, B, C, D) in series with duration and other resource requirements are as given below. Using Line of Balance (LOB) concept, schedule the project. 04

Operation	Duration (Weeks)	Labour Required (Number of Gangs)
A	4	1
B	3	2
C	6	1
D	2	2

- (c) Calculate the normal, least-cost, and crash durations for the following project. Calculate the cost associated with each duration. Indirect (overhead) costs are Rs.120 per day. 07

		Duration (Days)		Cost (Rs.)	
Activity	IPA	Normal	Crash	Normal	Crash
A	-	5	4	500	600
B	A	7	5	350	500
C	A	8	5	800	920
D	A	11	7	1200	1400
E	C	6	4	600	700
F	C	4	4	500	500
G	D,F	7	5	700	1000
H	E,F	6	5	300	420

Normal Distribution Function

Normal Deviate –	Probability (%)	Normal Deviate +	Probability (%)
0	50.0	0	50.0
– 0.1	46.0	+ 0.1	54.0
– 0.2	42.1	+ 0.2	57.9
– 0.3	38.2	+ 0.3	61.8
– 0.4	34.5	+ 0.4	65.5
– 0.5	30.8	+ 0.5	69.2
– 0.6	27.4	+ 0.6	72.6
– 0.7	24.2	+ 0.7	75.5
– 0.8	21.2	+ 0.8	78.8
– 0.9	18.4	+ 0.9	81.6
– 1.0	15.9	+ 1.0	84.1
– 1.1	13.6	+ 1.1	86.4
– 1.2	11.5	+ 1.2	88.5
– 1.3	9.7	+ 1.3	90.3
– 1.4	8.1	+ 1.4	91.3
– 1.5	6.7	+ 1.5	93.3
– 1.6	5.5	+ 1.6	94.5
– 1.7	4.5	+ 1.7	95.5
– 1.8	3.6	+ 1.8	96.4
– 1.9	2.9	+ 1.9	97.1
– 2.0	2.3	+ 2.0	97.7
– 2.1	1.8	+ 2.1	98.2
– 2.2	1.4	+ 2.2	98.6
– 2.3	1.1	+ 2.3	98.9
– 2.4	0.8	+ 2.4	99.2
– 2.5	0.6	+ 2.5	99.4
– 2.6	0.5	+ 2.6	99.5
– 2.7	0.3	+ 2.7	99.7
– 2.8	0.3	+ 2.8	99.7
– 2.9	0.2	+ 2.9	99.8
– 3.0	0.1	+ 3.0	99.9