15. (a) A project consists of activities from A to J as shown in the following table. The immediate predecessor(s) and the duration in weeks of each of the activities are given in the same table. Draw the project network and, find the critical path and the corresponding project completion time. Also, find the total float as well as free float for each of the non-critical activities. (16)

Activity	Immediate Predecessor (s)	Duration (weeks)
A	-	4
B	-	3
C	A, B	2
D	A, B	5
E	B	6
F	C	4
G	D	3
H	F, G	7
I	F, G	4
J	E, H	2

Or

(b) Consider the data of a project summarized in the following table :

Activity	Immediate Predecessor(s)	Duration (weeks)		
		a	m	b
A	-	4	4	10
B	-	1	2	9
C	-	2	5	14
D	A	1	4	7
E	A	1	2	3
F	A	1	5	9
G	B, C	1	2	9
H	C	4	4	4
I	D	2	2	8
J	E, G	6	7	8

(i) Construct the project network.

(ii) Find the expected duration and the variance of each activity.

(iii) Find the critical path and the expected project completion time.

(iv) What is the probability of completing the project on or before 35 weeks? (16)

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Question Paper Code : 80307

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Computer Science and Engineering

CS 6704 — RESOURCE MANAGEMENT TECHNIQUES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

(Uses of Normal Table is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define feasible solution and optimal solution to the linear programming problem.

2. What do you mean by shadow pricing?

3. What are the characteristics of a promal and dual problem?

4. State the necessary and sufficient condition for a transportation problem to have a solution.

5. Mention some important applications of integer programming problem.

6. Write down the methods for solving integer linear programming problems.

7. Write down the Lagraugian function for Khun-Tucker method for following non linear programming with inequality constraints.

8. Examine $f(x) = 6x^5 - 4x^3 + 10$ for extreme points.

9. If there are five activities P, Q, R, S and T such that P, Q, R have no immediate predecessors but S and T have immediate predecessors P, Q and Q, R respectively. Represent this situation by a network.

10. Define critical path.

PART B — (5 × 16 = 80 marks)

11. (a) Solve the following linear programming problem using graphical method. (16)

Maximize $Z = 100X_1 + 80X_2$

Subject to $5X_1 + 10X_2 \leq 50$

$8X_1 + 2X_2 \geq 16$

$3X_1 - 2X_2 \geq 6$

X_1 and $X_2 \geq 0$.

Or

(b) Solve the following LPP by simplex method. (16)

Max $Z = 4x_1 + x_2 + 3x_3 + 5x_4$

Subject to $4x_1 - 6x_2 - 5x_3 + 4x_4 \geq -20$

$3x_1 - 2x_2 + 4x_3 + x_4 \leq 10$

$8x_1 - 3x_2 + 3x_3 + 2x_4 \leq 20$

$x_1, x_2, x_3, x_4 \geq 0$.

12. (a) Use dual simplex method to solve the LPP. (16)

Maximize $Z = -3x_1 - 2x_2$

Subject to $x_1 + x_2 \geq 1$

$x_1 + x_2 \leq 7$

$x_1 + 2x_2 \geq 10$

$x_2 \leq 3$

and $x_1, x_2 \geq 0$.

Or

(b) Consider the problem of assigning four sales persons to four different sales regions as shown in the following table such that the total sales is maximized.

		Sales region			
		1	2	3	4
	1	10	22	12	14
Salesman	2	16	18	22	10
	3	24	20	12	18
	4	16	14	24	20

The cell entries represent annual sales figures in lakhs of rupees. Find the optional allocation of the sales persons to different regions. (16)

13. (a) Solve the following IPP. (16)

Minimize $Z = -2x_1 - 3x_2$

Subject to $2x_1 + 2x_2 \leq 7$

$x_1 \leq 2$

$x_2 \leq 2$

and $x_1, x_2 \geq 0$ and integers.

Or

(b) A student has to take examinations in three courses A, B and C. He has three days available for study. He feels it would be best to devote a whole day to the study of the same course, so that he may study a course for one day, two days or three days or not at all. His estimates of grades he may get by study are as follows :

Course/Study days	A	B	C
0	0	1	0
1	1	1	1
2	1	3	3
3	3	4	3

How should he plan to study so that he maximizes the sum of his grades? (16)

14. (a) Using Jacobian method Max $Z = 2x_1 + 3x_2$ (16)

Subject to $x_1 + x_2 + x_3 = 5$

$x_1 + x_2 + x_4 = 3$

$x_1, x_2, x_3, x_4 \geq 0$.

Or

(b) Solve the nonlinear programming problem by Khun-Tucker conditions. (16)

Minimize $f(x) = x_1^2 + x_2^2 + x_3^2$

Subject to $g_1(X) = 2x_1 + x_2 - 5 \leq 0$

$g_2(X) = x_1 + x_2 - 2 \leq 0$

$g_3(X) = 1 - x_1 \leq 0$

$g_4(X) = 2 - x_2 \leq 0$

$g_5(X) = -x_3 \leq 0$.