

KERALA AGRICULTURAL UNIVERSITY
B.Tech (Food. Engg) 2011 Admission
Vth Semester Final Examination- December /January -2013

Cat. No: Meen.3106
Title: Systems Engineering (2+0)

Marks: 80
Time: 3 hours

Part A (1 Mark each) 10 x 1.0 = 10.0

Fill in the blanks

1. A constraint that does not affect the feasible region is called -----
2. The proportion of time a server actually spends with customers is termed as -----
3. The process of reducing the time required for an activity by providing additional resources is called -----
4. The activity having next highest float than the critical activity is called -----
5. The dual of a dual problem is -----
6. The portion of total float which, which causes reduction in the float of subsequent activities is called -----

For question 7 to 10, select the best option from the following set

(Exponential distribution, Poissons distribution, Game theory, Maximax theory, Minmax theory, Jockeying, Balking)

7. Criterion of Optimism in Decision making Theory.
8. Pattern of input or arrival in queuing theory.
9. Nature of customer moving from one queue to another.
10. Rules governing decision making under conditions of conflict.

Part B (3 Marks each, Answer any 10 questions) 10 x 3.0 = 30.0

1. Explain the common types service disciplines.
2. Differentiate between free float and independent float.
3. How is regret table constructed?
4. Discuss the major differences between PERT and CPM.
5. What are slack, surplus and artificial variables?

6. What is unbalanced transportation problem? How is it modified for finding the feasible solution?
7. Explain Expected Monetary Value (EMV)?
8. Discuss the various steps involved in decision theory.
9. What is the difference between AON and AOA network diagrams?
10. Explain the characteristics of canonical form of LPP.
11. What is least cost method (LCM) of finding initial feasible solution in a transportation problem?
12. Differentiate between Big-M method and Two-Phase Method.

Part C (5 Marks each, Answer any 6 questions) 6 x 5.0 = 30.0

1. What is Expected Value of Perfect Information (EVPI)? How is it computed? What is its significance?
2. Write the dual of the following LPP.

$$\text{Minimize } Z = 20 X_1 + 40 X_2$$

Subject to

$$2 X_1 + 20 X_2 \geq 40$$

$$20 X_1 + 3 X_2 \geq 20$$

$$4 X_1 + 15 \geq X_2$$

$$X_1, X_2 \geq 0$$

3. Solve the following LPP graphically.

$$\text{Maximize } Z = 2 X_1 + 3 X_2$$

Subject to

$$X_1 + X_2 \leq 30$$

$$X_2 \geq 3$$

$$X_1 \leq 12$$

$$X_1 - X_2 \geq 0$$

$$0 \leq X_1 \leq 20$$

4. Find the initial feasible solution to the following transportation problem by Vogel's approximation Method and check its optimality.

		Destinations					Supply
		D1	D2	D3	D4	D5	
Origin	O1	2	11	10	3	7	4
	O2	1	4	7	2	1	8
	O3	3	9	4	8	12	9
Demand		3	3	4	5	6	

5. What are the assumptions made in single channel, single phase queuing models?
6. A firm manufacturing a nutritional cookie in two sizes S1 and S2. Size S1 contains 4 grains of element X, 7 grains of element Y and 2 grains of element Z. Size S2 contains 2 grains of element X, 10 grains of element Y and 8 grains of element Z. It is found that the users need to take 12 grains of element X, 74 grains of element Y, and 24 grains of element Z to get the required quantity of nutrition. It is required to find the least number of cookies consumed by person to get the required level of nutrition. Formulate the problem as a standard LPP.
7. Discuss the necessity for maintaining inventory.
8. The dependency relationships between various activities are given below. Draw the network diagram.

Activity	A	B	C	D	E	F
Duration (Days)	8	10	12	4	5	7

Immediate Predecessor	-	-	-	A, B	B	B, C
-----------------------	---	---	---	------	---	------

Part D (10 Marks each, Answer any 1 question) 1 x 10.0 = 10.0

1. Solve the following LPP

$$\text{Minimize } Z = X_1 - 3X_2 + 2X_3$$

Subject to

$$3X_1 - X_2 + 2X_3 \geq 7$$

$$-2X_1 + 4X_2 \leq 12$$

$$-4X_1 + 3X_2 + 8X_3 \leq 10$$

$$X_1, X_2, 2X_3 \geq 0$$

2. The time estimates in weeks for the activities of a PERT network are given below.

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Draw the critical path and determine the expected project length. What is the probability that the project will be (a) completed at least 4 weeks earlier than the expected time? (b) no more than 4 weeks later than the expected time?