

KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food. Engg) 2012 Admission

Vth Semester Final Examination- January -2014

Cat. No: Meen.3106

Title: Systems Engineering (2+0)

Marks: 80

Time: 3 hours

I. Fill up the blanks / state true or false (10x1 = 10)

1. The activity that does not consume time or resource is called -----
2. The tendency of customers not entering the queue due to its length is commonly called as -----
3. The slack of each node in the critical path will be equal to -----
4. ----- is the portion of the total float, which causes a reduction in the float of the subsequent activities.
5. The objective function formed as the sum of all artificial variables in the first phase of a two phase simplex method is always to be -----
6. The input or arrival distribution in single channel single phase queuing model follows ----- distribution

Write True or False

7. Pessimistic time estimate is always greater than or equal to optimistic time estimate.
8. Least cost method will always give the better initial feasible solutions for a transportation problem.
9. Assignment problems are special type of transportation problems.
10. Artificial variables are given high negative or positive coefficients in the objective function for eliminating it in the final feasible solution.

II. Write short notes on ANY TEN (10x3 = 30)

1. Explain the different time estimates used in PERT.
2. Differentiate between the criterion of optimism and criterion of pessimism in decision theory.
3. What is the difference between activity and node? How are they represented in network diagram?
4. How is Transportation Problem different from Assignment Problem?
5. Explain the significance of Expected Value of Perfect Information (EVPI).
6. Explain the use slack, surplus and artificial variables in simplex method.
7. Explain various environments in decision making based on degree of certainty.
8. Differentiate between standard and canonical forms LPP.
9. What are the basic differences between normal simplex method and dual simplex method?
10. Explain Fulkerson's rule in numbering events.

11. "Crashing is to be done on activities in the critical path" – Discuss
12. Explain simulation and its importance.

III. Write short essays on ANY SIX

(6x5 = 30)

1. Graphically represent the waiting time and cost of providing service and discuss the importance of queuing theory.
2. Solve the following LPP graphically

Maximize $Z = X_1 - 2 X_2$

Subject to $-X_1 + X_2 \leq 1$

$0 \leq X_1 \leq 5$

$6 X_1 + 4 X_2 \geq 24$

$2 \leq X_2 \leq 4$

3. The manager of a company has to decide upon the optimal mix of two possible processes, of which the inputs and outputs per production run are as follows.

Process	Input		Output	
	Grade 1	Grade 2	Product 1	Product 2
P1	5	3	5	8
P2	4	5	4	4

The maximum amount availability of Grade 1 and Grade 2 inputs are 200 and 150 units respectively. Market requirements show that at least 100 units of product 1 and 80 units of product 2 have to be produced. The profit per production run from Process P1 and Process P2 are Rs 30 and Rs 40 respectively. Formulate the problem as a linear programming problem for maximizing the profit.

4. The activities and durations of a project are shown in the following table. Draw the network diagram; find the minimum duration to complete the project and the critical path.

Activity	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration in weeks	15	15	3	5	8	12	1	14	3	14

5. Discuss the steps involved in solving a LPP using artificial variable techniques.
6. Explain the various criterion used for decision making under conditions of uncertainty.
7. How the following situations in an assignment problem : are handled?
(a) Maximization (b) Unbalance Problem.

8. Find the initial feasible solution to the following problem by minimum cost method and north-west method and state which of the method is better in this case.

Source	Destinations			Supply
	X	Y	Z	
A	2	7	4	5
B	3	3	1	8
C	5	4	7	7
D	1	6	2	14
Demand	7	9	18	

IV. Write essay on ANY ONE

(1x10 = 10)

1. Solve the following Linear Programming Problem.

Maximize $Z = 5X_1 - 4X_2 + 3X_3$

Subject to: $2X_1 + X_2 - 6X_3 = 20$

$8X_1 - 3X_2 + 6X_3 \leq 50$

$6X_1 + 5X_2 + 10X_3 \leq 76$

$X_1, X_2, X_3 \geq 0$

2. The following table shows the activities and their duration in days of a project.

Job (i-j)	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
to	3	2	6	2	5	3	1	3	4
tm	6	5	12	5	11	6	4	9	19
tp	15	14	30	8	17	15	7	27	28

(a) Draw the project network

(b) Calculate the length and variance of the critical path.

(c) What is the probability that the jobs on critical path will be completed in 41 days?