KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2012 Admission

Vth Semester One time Special Re-Examination-June -2016

Cat. No: Meen. 3106 **Marks: 80.00**

Title: Systems Engineering (2+0) **Time: 3 hours**

PART A (10 x 1 = 10.0)

Fill in the blanks

1. The input or arrival distribution in single channel single phase queuing model follows ---------- distribution
2. The variable added to a less than equal to constraint for converting to equation is called ----------
3. The activity that does not consume time or resources is called ---------- activity.
4. Graphical method of solution of linear programming problems can only be used if the number of decision variables are equal to --------
5. By default, the objective function of a transportation problem is to ----------

Write TRUE or False

6. Least cost method will always give the better initial feasible solutions for a transportation problem.
7. PERT is activity oriented.
8. Critical path will always be the shortest path of a project.
9. Pessimistic time estimate is always greater than or equal to optimistic time estimate.
10. Redundant constrains are the constraints which does not affect the optimal solution.

PART B (Answer any ten) (10 x 3 = 30.0)

1. Differentiate between big M and artificial methods.
2. Explain the procedure for numbering nodes in a project network diagram.
3. Differentiate between the criterion of optimism and criterion of pessimism in decision theory.
4. Explain Expected Monetary Value (EMV)?
5. Explain different time estimates in PERT.
6. What is simulation?
7. What are the different types of service disciplines?
9. What is the difference between activity and node? How are they represented in network diagram?

10. What is payoff table?

11. Explain the context in which decision trees will be useful.

12. What is inventory control?

PART C (Answer any six) (6 x 5 = 30 .0)

1. Differentiate between standard and canonical forms of linear programming problem.

2. Explain the mathematical model of an assignment problem.

3. Discuss why is queuing theory is important.

4. 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

Draw the project network and find out the critical path.

5. The manager of a company has to decide upon the optimal mix products P1 and P2, which utilizes three types of raw materials R1, R2, and R3. Requirement and the maximum availability of each type of raw material are tabulated below.

	Raw Materials		
Process	R1	R2	R3
P1	5	20	10
P2	2	40	50
Availability	35	400	300

The profit per production for products P1 and P2 are Rs 100 and Rs 60 respectively. Formulate the problem as a linear programming problem for maximizing the profit and solve it graphically.

6. An airline which operates 7 days a week has the following time table. Crew must have a minimum layover time of six hours between the flights. Obtain the pairing of planes that minimizes the layover time away from the home for any given pair. The crew will be based at the city that results in smaller layover.

Flight No	Departure Delhi	Arrival Kolkatta	Flight No	Departure Kolkatta	Arrival Delhi
001	7 AM	9 AM	101	9 AM	11 AM

002	9 AM	11 AM	102	10 AM	12 NOON
003	1.30 PM	3.30 PM	103	3.30 PM	5.30 PM
004	7.30 PM	9.30 PM	104	8 PM	10 PM

7. What is Expected Value of Perfect Information (EVPI)? How is it computed? What is its significance?

8. Write the dual of the following LPP.
Minimize $Z = 20 X_1 + 40 X_2$

Subject to

$2 X_1 + 20 X_2 \geq 40$

$20 X_1 + 3 X_2 \geq 20$

$4 X_1 + 15 \geq X_2$

$X_1, X_2 \geq 0$

PART D (Answer any one) **(1 x 10 = 10.0)**

1. Solve the following Linear Programming Problem.

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

Subject to:

$2X_1 + X_2 - 6X_3 = 20$

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

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

$X_1, X_2, X_3 \geq 0$

2. A construction company has four large bulldozers located at four different stations. The bulldozers have to be moved to four different construction sites. The distance between the stations and sites are given in the following table.

Station / Site	S1	S2	S3	S4
B1	90	75	75	80
B2	35	85	55	65
B3	125	95	90	105
B4	45	110	95	115

How should the bulldozers to be moved so as to minimize the total distance travelled?