KERALA AGRICULTURAL UNIVERSITY

B.Sc (Food.Engg) 2013 Admission

Vth Semester Final Examination-January -2016

Cat. No: Meen 3106 **Marks: 50.00**

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

I Fill in the blanks **(10 x 1=10)**

1. .... is the portion of the total float,which causes a reduction in the float of the subsequent activities
2. The activity that does not consume time or resource is called ....
3. The dual of a dual LP is ....
4. The input or arrival distribution in single channel single phase queuing model follows .... distribution
5. The stack of each node in the critical path will be equal to ....
6. The tendency of customers not entering the queue due to its length is commonly called as .....

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. An artificial variable column can be dropped completely from the simplex tableau,once that variable become non-basic

II Answer any Five questions **(5 x 2=10)**

1. Discuss the application of PERT and CPM
2. Explain the significance of Expected Value of Perfect Information (EVPI)
3. Differentiate between the criterion of optimism and criterion of pessimism in decision theory
4. How is Transportation Problem different from Assignment Problem?
5. What are the characteristics of standard form of Linear Programming problem
6. Explain Fulkerson's rule in numbering events
7. Write the dual of the following Linear Programming Problem

Minimize $z = x_1 - 3X_2 - 2X_3$

Subject to : $3X_1 - X_2 + 2X_3 \leq 7$

$2X_1 + 4X_2 + \geq 12$

$-4X_1 + 3X_2 + 8X_3 = 10$

$X_1, X_2 \geq 0$, X_3 unrestricted

III Answer Any Five questions (5 x 4=20)

1. Graphically represent the waiting time and cost of providing service and discuss the importance of queuing theory.
2. An agriculturist has a farm with 125 acres. He produces Radish, Muttar and Potato. Whatever he raises is fully sold in the market. He gets Rs.50/kg for Radish, Rs.40/kg for Muttar and Rs.50/kg for Potato. The average yield (kg/acre) for Radish,Muttar and Potato are 1500, 1800, 1200 respectively. To produce each 100 kg of Raddish and Muttar and to produce each 80 kg potato a sum of Rs.125 has to be used for manure. The labour requirements for raising the crop in each acre are 6, 5, 6 man days for Raddish, Muttar and Potato respectively. A total 500 man days at a labour rate Rs.400/ day are available. Formulate this as a linear Programming model to maximize profit of the agriculturist.
3. The manager of a company has to be decide upon the optimal mix of two possible processes, of which the inputs and outputs per production are as follows:

	Input		Output	
Process	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 atleast 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. An investor has Rs.1000 with him on Monday. He has the following investment option available on each day. If the invests two units of money on one day, and one unit on the next day, then on the following day he gets a return of four units. Formulate a programming problem to determine the optimal investment policy, which will maximize the money he has on Saturday of the same week.
5. 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

6. How the following situations in an assignment problem are are handled?

   a)Maximization (b) Unbalance Problem

7. 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	7
B	3	3	1	8
C	5	4	7	7
D	1	6	2	12
Demand	7	9	18	

IV Answer Any One questions **(1 x 10=10)**

1. Solve the following Linear Programming Problem

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

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

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

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

$X_1, X_2, X_3 \geq 0$

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

Job (i-j)	1-2	1-3	1-4	2-5	3-5	4-6	5-6
to	1	1	2	1	2	2	3
tm	1	4	2	1	5	5	6
tp	7	7	8	1	14	8	15

a) Draw the project net work

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 19 days?