



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg.) 2019 Admission
V Semester Final Examination-January 2022

Meen.3106

Systems Engineering (2+0)

Marks:50
Time: 2hours

I Fill in the blanks (10x1=10)

1. The graphical method can only be used when there are only _____ decision variables.
2. Dummy source or dummy destination will occur in the case of _____.
3. _____ is the time an activity can be delayed without affecting the start time of any other activity.
4. The critical path represents the _____ time required to complete the project.
5. By north-west corner rule we always get a _____.

State True or False

6. Early start time (ES) is computed from right to left (backward pass).
7. Every network has atleast one critical path.
8. If the right-hand side of a constraint is changed, the feasible region will not be affected and will remain the same.
9. Vogel's approximation method tackles the problem of finding a good initial solution by taking into account the costs associated with each route alternative.
10. In the assignment model, each person can be assigned to one and only one job.

II Write short notes on ANY FIVE of the following (5x2=10)

1. Define LPP in the mathematical form.
2. What is the criterion for the entering variable and outgoing variable in a simplex method?
3. Write the standard form of LPP for the following LPP: Maximize $Z = 12X_1 + 25X_2$, Subject to $8X_1 + 9X_2 \leq 35$, $3X_1 + 2X_2 \geq 45$, $X_1, X_2 \geq 0$
4. List assumption of linear programming.
5. State the mathematical formulation for Assignment Problem.
6. Write uses of PERT/CPM techniques.
7. Define terms: Activity, Event, Dummy Activity and Critical Activity.

III Answer ANY FIVE of the following (5x4=20)

1. A firm manufactures two products A and B on which the profits earned per unit are Rs.3 and Rs.4 respectively. Each product is processed on two machines M1 and M2. Product A requires one minute of processing time on M1 and two minutes on M2 while Product B requires one minute on M1 and one minute on M2. Machine M1 is available for not more than 7 hours, while machine M2 is available for 10 hours during any working day. Formulate the number of units of products A and B to be manufactured to get maximum profit.
2. Solve the following LP problem graphically
Minimize $Z = 3X_1 + 2X_2$
Subject to $5X_1 + X_2 \geq 10$, $X_1 + X_2 \geq 6$, $X_1 + 4X_2 \geq 12$, $X_1, X_2 \geq 0$.
3. Determine an initial basic feasible solution by Vogel's Approximation method.

Source	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

4. Solve the following Assignment Problem

	I	II	III	IV
1	11	10	18	5
2	14	13	12	19
3	5	3	4	2
4	15	18	17	9

5. What is float? What are the different types of float?
 6. Explain about Big-M method for solving LPP by the Simplex method.
 7. Write the dual of the following LPP.
 Minimize $3X_1 - 2X_2 + 5X_3$
 Subject to $8X_1 + 3X_2 \leq 220$, $3X_1 + 5X_2 - 2X_3 \geq 80$, $X_1, X_2, X_3 \geq 0$

IV Write an essay on ANY ONE of the following (1x10=10)

1. The data for a PERT network given in the following table. Determine the critical path and the expected duration of completion of the project. Also calculate the probability that the project duration will exceed 60 days.

Activity	1-2	1-3	1-4	2-3	2-5	3-4	3-6	4-6	5-6
Optimistic time	2	6	6	2	11	15	3	9	4
Most likely time	4	6	12	5	14	24	6	15	10
Pessimistic time	6	6	24	8	23	45	9	27	16

2. Solve the following problem by simplex method
 Maximize $Z = 3X_1 + 2X_2 + 5X_3$
 Subject $X_1 + 2X_2 + X_3 \leq 430$, $3X_1 + 2X_3 \leq 460$, $X_1 + 4X_2 \leq 420$, $X_1, X_2, X_3 \geq 0$
