



KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Food Engg. & Tech.) 2018 Admission

V Semester Final Examination-February-2021

Meen. 3106

Systems Engineering (2+0)

Marks: 50
Time: 2 hours

I Choose the correct answer

(10x1=10)

1. The linear function of variables which is to be maximized or minimized is called _____.
(a) constraints (b) objective function
(c) basic requirements (d) none of them
2. The column introduced in the matrix to balance the rim requirements is known as:
(a) Key column (b) Idle column
(c) Slack column (d) Dummy Column
3. The total number of allocation in a basic feasible solution of transportation problem of $m \times n$ size is equal to:
(a) $m \times n$ (b) $(m/n) - 1$
(c) $m + n + 1$ (d) $m + n - 1$
4. The key column in Simplex method of solving optimization problem indicates:
(a) Outgoing variable (b) Incoming variable,
(c) Independent variable, (d) Dependent variable
5. In the optimal solution, more than one empty cell have their opportunity cost as zero, it indicates:
(a) The solution is not optimal (b) The problem has alternate solution
(c) Something wrong in the solution (d) The problem will cycle.
6. Maximization of objective function in LPP means:
(a) Value occurs at allowable set (b) highest value is chosen among allowable decision
(c) none of the above (d) all of the above
7. To solve degeneracy in the transportation problem we have to:
(a) Put allocation in one of the empty cell as zero (b) Put a small element epsilon in any one of the empty cell
(c) Allocate the smallest element (d) Allocate the smallest epsilon in such a cell, which will not form a closed loop with other loaded cells.
8. A steady state exists in a queue if
(a) $\lambda > \mu$ (b) $\lambda < \mu$
(c) $\lambda \leq \mu$ (d) $\lambda \geq \mu$
9. The expediting or follow up function in production control is an example of
(a) LIFO (c) FIFO
(c) SIRO (d) Pre-emptive
10. To convert \geq type of inequality into equations, we have to
(a) Add slack variable (b) Subtract slack variable
(c) Subtract surplus variable (d) Add surplus variable

II Write Short notes on ANY FIVE of the following

(5x2=10)

1. State the difference between analytic procedure and iterative procedure.

2. List any four classifications of models in operation research.
3. List any four requirements of employing linear programming problem techniques.
4. When does degeneracy happen in transportation problem?
5. Unbalanced assignment problem.
6. Mathematical Model.
7. Briefly explain phases of Project management.

III Answer ANY FIVE of the following.

(5x4=20)

1. Role of Operation Research in Engineering.
2. Characteristics of linear programming problem.
3. Explain in brief network construction.
4. Maximize $f(\mathbf{x}) = x_1 + 2x_2$ subject to:

$$x_1 + 2x_2 \leq 5$$

$$x_1 + x_2 \leq 4$$

$$2x_1 + x_2 \leq 6$$

$$x_1 \geq 0$$

$$x_2 \geq 0$$

5. A duplication machine maintained for office use is operated by office assistant. The time to complete each job varies according to an exponential distribution with mean 6 min. Assume a Poisson input with an average arrival rate of 5 jobs per hour. If an 8-hour day is used as a base, determine
 - a) The percentage of idle time of the machine.
 - b) The average time a job is in the system.
6. What is the probability that a customer has to wait more than 15 minutes to get his service completed in (M/M/I): (∞ / FIFO) queue system, if $\lambda = 6$ per hour and $\mu = 10$ per hour?
7. Define queuing models and also its applications.

IV Solve the following questions(ANY ONE)

(1x10=10)

1. Maximize $f(\mathbf{x}) = 2x_1 + 3x_2 + 2x_3$ subject to:

$$x_1 + 2x_2 + x_3 \leq 4$$

$$3x_1 + x_2 + x_3 \leq 5$$

$$x_1 + x_2 + 2x_3 \leq 4$$

$$x_1 + x_2 + x_3 \leq 3$$

$$x_1 \geq 0$$

$$x_2 \geq 0$$

$$x_3 \geq 0$$

2. Compare and contrast the project evaluation and review technique (PERT) with the critical path method (CPM).