

Reg. No. : 

--	--	--	--	--	--	--	--	--	--	--	--

<b>Question Paper Code: 1146110</b>
-------------------------------------

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Mechanical Engineering

U20BS601 – OPERATIONS RESEARCH

(Regulation 2020)

(Common to Robotics and Automation)

Time: Three Hours

Maximum: 100 Marks

Answer ALL questions

PART – A

(10 x 2 = 20 Marks)

1. State the objectives of Operations Research.
2. What are the limitations of Big M method over Two-phase method?
3. What Criterion is used for outgoing variable in dual simplex method?
4. What do you understand by tighter constraint?
5. How row reduction is obtained in the Hungarian method of solving an assignment problem?
6. Distinguish between Transportation problem and Assignment Problem.
7. Write the four inventory models.
8. Write the equation for Re order level.
9. Classify queuing models on the basis of nature of inputs and service facilities.
10. Find the traffic intensity for the mean arrival rate of the customers is 30 per day and the service rate of the server is 20 per day.

PART – B

(5 x 16 = 80 Marks)

- 11.(a)(i) Give the comparison between graphical and simplex methods for solving LPP. (6)
- (ii) A company manufactures two product A and B. These are machined on machines X and Y. A takes one hour on machine X and one hour on Machine Y. Similarly product B takes 4 hours on Machine X and 2 hours on Machine Y. Machine X and Y have 8 hours and 4 hours as idle capacity. The planning manager wants to avail the idle time to manufacture A and B. The profit contribution of A is Rs. 3/- per unit and that of B is Rs.9/- per unit. Find the optimal product mix. (10)

(OR)

- 11(b) (i) Write short notes on basic assumption of LPP and formation of LPP. (6)
- (ii) Old hens can be bought for Rs.2.00 each but young ones costs Rs. 5.00 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week. Each egg costs Rs. 0.30. A hen costs Rs.1.00 per week to feed. If the financial constraint is to spend Rs.80.00 per week for hens and the capacity constraint is that total number of hens cannot exceed 20 hens and the objective is to earn a profit more than Rs.6.00 per week, find the optimal combination of hens. (10)

- 12 (a) (i) Describe Revised Simplex Method (6)
- (ii) Maximize  $Z = 0.75a + 1b$  S.T. (10)
- $1a + 1b \geq 0$
- $-0.5a + 1b \leq 1$ , and both  $a$  and  $b$  are  $\geq 0$

(OR)

- (b) (i) Explain the significance of Slack variable, Surplus variable, Artificial variable in linear programming resource allocation model. (6)
- (ii) Max  $Z = 3x_1 + 2.5x_2$ , subject to  $2x_1 + 4x_2 \geq 40$  (10)
- $3x_1 + 2x_2 \geq 5$

Solve by dual simplex method.

13. (a) (i) Explain MODI method. (8)
- (ii) The following details are available regarding a project:

Activity	Predecessor	Duration (Weeks)
A	–	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

Determine the critical path, the critical activities and the project completion time. (8)

(OR)

- (b) (i) Explain the procedure of getting basic feasible solution by using VAM. (8)  
(ii) Explain Kruskal's Algorithm to solve Minimum spanning tree with an example. (8)

- 14 (a) (i) Describe the components that constitute the stock holding costs. (8)  
(ii) A producer has to supply 12,000 units of a product per year to his customer. The demand is fixed and known and backlogs are not allowed. The inventory holding cost is Rs.0.20 per unit per month and the set up cost per run is Rs. 350/- per run. Determine (a) the optimal lot size, (b) Optimum scheduling period, (c) Minimum total expected yearly cost. (8)

(OR)

- (b) The demand for an item is 8000 units per annum and the unit cost is Re.1/-. Inventory carrying charges of 20% of average inventory cost and ordering cost is Rs. 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders. (16)

- 15 (a) (i) Write short notes on queuing models (6)  
(ii) There is a congestion of the platform of a railway station. The trains arrive at the rate of 30 trains per day. The waiting time for any train to hump is exponentially distributed with an average of 36 minutes. Calculate: (a) The mean queue size, (b) The probability that the queue size exceeds 9. (10)

(OR)

- (b) Jobs arrive at an inspection station according to Poisson process at a mean rate of 2/hr and are inspect one at a time on a FIFO basis. The quality control engineer both inspects and makes minor adjustments. The total service time for the job appears to be ED with a mean of 25mins. Jobs that arrive but cannot be inspected immediately by the engineer must be stored until the engineer is free to take them. Each job requires 1 sq mts space determine  
(i) The waiting line length  
(ii) The waiting time  
(iii) % of idle time of the engineer  
(iv) The floor space to be provided in the quality control room. (16)

----- XXX -----