



B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2016

(Regulation 2013)

Seventh Semester

U13GST004: OPERATIONS RESEARCH

(Common to ME & IT)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Simplex method is used to solve LP problems with:
 - a) Two or more variables
 - b) Four variables only
 - c) Six variables only
 - d) Eight variables only
2. In two phase simplex method, artificial variables will considered in the phase of solving the problem only.
3. If the following occurs, it indicates the existence of alternate solution(s) in an assignment problem.
 - a) Compulsory allocations while solving the problem
 - b) The number of rows is less than number of columns
 - c) No compulsory allocations while solving the problem
 - d) The number of columns is less than number of rows
4. While attempting to solve an assignment problem the number of rows should bel to the number of columns.
5. On network schedule graphs, the dotted lines on the arrow represent the
 - a) Slack of the activity
 - b) Cost of the activity
 - c) Flexibility of the activity
 - d) Criticality of the activity
6. In activity on arrow (AOA) scheme of networking, the circles before and after the arrows are called
7. The time taken to complete all the jobs in the optimal sequence adapting the process order is called as:
 - a) Ideal time
 - b) Idle time
 - c) Optimal time
 - d) Elapse time
8. One of the conditions to be satisfied to convert a “n jobs × 5 machine” sequencing problem to a “n job × 2 machine” sequencing problem (processing order ABCDE) is
9. The method of selection describing the manner in which customers from the queue are selected for service is called as:
 - a) Queuing selection order
 - b) Queuing service
 - c) Queuing discipline
 - d) Queuing pattern
10. The queuing discipline experienced by customers who use a lift that is operated between the ground and first floor is called as

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. State the scope of operations research.
12. State the four steps in formulating a linear programming model.
13. Why a transportation problem has to be balanced and then solved?
14. How to find whether the solution to a transportation problem is unique or not?
15. Draw the activity on arrow diagram for the following details.

ACTIVITY	A	B	C	P	Q	R
IMMEDIATE PREDECESSOR	-	-	-	A,B	B,C	A,B,C

16. Explain with a network diagram the way to use Fulkerson rule to number networks.
17. State the advantages of group replacement policy compared to individual replacement.
18. Which is the best period to replace an item using group replacement policy?
19. Give an example for the queuing discipline “Service in random order”.
20. State the importance of EOQ.

PART C (5 x 14 = 70 Marks)
(Answer not more than 400 words)

Q.No. 21 is Compulsory

21. A chemical company has two bottling plants situated at two cities A and B. Each plant produces 3 types of chemicals: type – I, type – II, type – III. The number of bottles produced per day is as follows:

CHEMICAL TYPE	PLANT AT CITIES	
	A	B
I	1500	1500
II	3000	1000
III	2000	5000

A market survey indicates that there will be a demand of 20,000 bottles of type – I chemical, 40,000 bottles of type – II chemical, and 44,000 bottles of type – III chemical. The operating costs per day of the plant A and B are Rs. 600 and Rs. 400 respectively. For how many days each plant should run in the month of May so as to have a minimum production cost, while still meeting the market demand. Obtain the solution by graphical method.

22. a) In a (3 x 3) transportation problem, let x_{ij} be the amount shipped from source i to destination j and C_{ij} the corresponding per unit transportation cost. The supplies at source 1, 2, 3 are 15, 35, 90 units respectively and the demands at destinations 1, 2, 3 are 25, 35, 80 units. Assume that the starting solution obtained by the ‘North West Corner’ method gives the optimal basic solution to the problem. Let the associated values of multipliers (u and v values) for sources 1, 2, 3 be -2, 3, 5 respectively and those for destinations 1, 2, 3 be 2, 5, 10 respectively.
 - Find the total optimal transportation cost.
 - What are the smallest values of C_{ij} for the non-basic variables which will keep the above solution optimal?

(OR)

- b) There are 5 jobs and 5 machines. The associated cost of allocating a job to the machines is given in the table.

		Machines				
		M	M	M	M	M
		1	2	3	4	5
Jobs	J1	11	17	8	16	20
	J2	9	7	12	6	15
	J3	13	16	15	12	16
	J4	21	24	17	28	26
	J5	14	10	12	11	15

It is required to assign one job to each of the 5 machine. Determine the optimal assignment of jobs so that the total cost to process all the jobs is minimized.

23. a) Listed in the table are the activities and sequencing requirements necessary for completing a project. Determine the critical path, critical duration after constructing the network.

Activity	Description	Precedence	Duration(weeks)
A	Literature survey	-	6
B	Hypothesis formulation	-	5
C	Feasibility study	B	2
D	Formal proposal	C	2
E	Field analysis	A,D	2
F	Progress report	D	1
G	Formal research	A,D	6
H	Data collection	E	5
I	Data analysis	G,H	6
J	Conclusions	I	2
K	Rough draft	G	4
L	Final copy	J,K	3
M	Oral presentation	L	1

(OR)

- b) i) If two paths are critical paths on a network, what is the norm to decide which one of the two paths is the most critical path? (4)
- ii) List the logic rules to draw networks and explain networking errors. (10)

24. a) Small battery operated trucks are used in an industry for material handling purpose. The operating cost (battery / distilled water), maintenance cost (repairs, replacement of parts such as tyres etc.) and resale value for six years are given in table for one of these trucks. Determine when the truck is to be replaced by a new one if the initial cost of the truck is Rs. 75,000.

Year of service	Annual operating cost (Rs.)	Annual maintenance cost (Rs.)	Resale value
1	10,000	6,000	45,000
2	12,000	7,500	40,000
3	15,000	12,500	20,000
4	19,000	17,000	10,000
5	27,000	20,000	10,000
6	33,000	21,000	5,000

(OR)

- b) There are six jobs, each of which must go through two machines A and B in the order AB. Processing time in hours is given in table.

Job	Processing time	
	Machine A	Machine B
1	3	2
2	6	5
3	4	6
4	7	3
5	5	2
6	8	8

Determine the sequence for the six jobs which will minimize the elapse time and idle time.

25. a) (i) Explain the techniques of inventory management and state its relevance. (10)
(ii) Spell the role of variables in inventory problems. (4)

(OR)

- b) i) What is Kendall's notation used for? Give an example. (4)
ii) Customers arriving at an industrial consultant's office are according to Poisson's distribution at the rate of 28 per hour. The waiting room can accommodate not more than 14 customers. Consultation time per customer is exponential with a mean rate of 20 per hour. Find the effective arrival rate at the consultant's office. What is the expected waiting time of a customer in the consultant's office? (10)
