

Reg.No.: 

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN  
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]  
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 60027**

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Third Semester

Information Technology

P23ITE13 – OPTIMIZATION TECHNIQUES

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What are the decision variables in LPP?	2	K1	CO1
2.	Specify the various stages in operations research?	2	K1	CO1
3.	Define the objective of transportation model.	2	K1	CO2
4.	Specify the route conditions in travelling salesman problem.	2	K2	CO2
5.	Differentiate between PERT and CPM.	2	K3	CO3
6.	What is total float?	2	K1	CO3
7.	List necessary conditions in unconstrained problems.	2	K1	CO4
8.	Define equality constraints.	2	K1	CO4
9.	Compare Parallel queues and Sequential queues.	2	K1	CO5
10.	What is M/M/1 Queueing model?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

- | Q.No.  | Questions  | Marks | KL | CO  |
|--------|--|-------|----|-----|
| 11. a) | Briefly discuss about Models in operations research. | 13    | K1 | CO1 |

(OR)

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|----|--|----|----|-----|
| b) | Solve the given LPP using Simplex method.<br>MAX $Z=6X_1+12X_2$<br>Subject to $3X_1+4X_2 \leq 12$ , $10X_1+5X_2 \leq 20$ , $(X_1, X_2 \geq 0)$ . | 13 | K2 | CO1 |
|----|--|----|----|-----|

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|--------|---|----|----|-----|
| 12. a) | Solve the following cost-minimizing transportation problem. | 13 | K2 | CO2 |
|--------|---|----|----|-----|

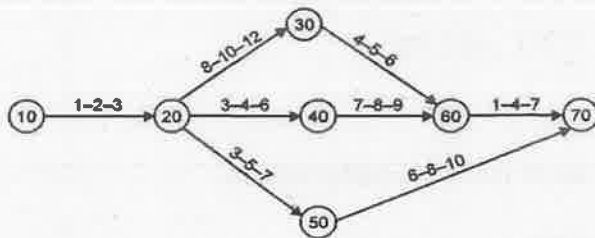
	D1	D2	D3	D4	D5	D6	Available
O1	2	1	3	3	2	5	50
O2	3	2	2	4	3	4	40
O3	3	5	4	2	4	1	60
O4	4	2	2	1	2	2	30
Required	30	50	20	40	30	10	180

(OR)

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|----|--|----|----|-----|
| b) | Find the optimal assignment for the assignment problem with following cost matrix: | 13 | K2 | CO2 |
|----|--|----|----|-----|

	I	II	III	IV
A	5	3	1	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	6

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|--------|--|----|----|-----|
| 13. a) | Consider the PERT network given in the following figure: | 13 | K3 | CO3 |
|--------|--|----|----|-----|



Determine the float of each activity and identify the critical path if the scheduled completion time for the project is 20 weeks.

(OR)

- b) Draw the network and find the critical path. Also find earliest start, earliest finish, latest start and latest finish of each activity. 13 K3 CO3

Activity	Duration
1-2	8 days
1-3	4
2-4	10
2-5	2
3-4	5
4-5	3

14. a) Investigate  $f(x) = x^4 - 2x^2 - 16x + 1$  for maxima and minima. Use Newton-Raphson method to determine the extreme value to 3 decimal places. 13 K3 CO4

(OR)

- b) Solve the non-linear programming problem by Kuhn-Tucker conditions. 13 K3 CO4

Minimize  $f(x) = x_1^2 + x_2^2 + x_3^2$

Subject to

$g_1(X) = 2x_1 + x_2 - 5 \leq 0$

$g_2(X) = x_1 + x_2 - 2 \leq 0$

$g_3(X) = 1 - x_1 \leq 0$

$g_4(X) = 2 - x_2 - 5 \leq 0$

$g_5(X) = -x_3 \leq 0$

15. a) At a one-man barbershop, the customer arrives according to Poisson process at an average rate of 5 per hour and they are served according to exponential distribution with an average service rate of 10 minutes. There are only 5 seats available for waiting of the customer and customer do not wait if they find no seat available. Find the average number of customer in the system, average queue length and the average time a customer spends in the barbershop. Also find the idle time of the barber. 13 K3 CO5

(OR)

- b) In a railway marshalling yard goods trains arrive at a rate of 30 trains per day. Assume that the inter arrival time follows exponential distribution and the service time distribution is also exponential with an average of 36 minutes. 13 K3 CO5

Calculate the following

- The probability that the queue size is at least 10.
- If the input of the trains increases to an average of 33 per day, what will be the change in the above quantities.

PART – C

(1 x 15 = 15 Marks)

- | Q.No.  | Questions   | Marks | KL | CO  |
|--------|---|-------|----|-----|
| 16. a) | A Computer centre has got 4 programmers. The centre needs 4 application programmes to be developed. The centre head, after studying carefully the programmes to be developed, estimates the computer time (in minutes) required by the respective experts to develop the application programmes as follows: | 15    | K4 | CO2 |

	Programmes			
	A	B	C	D
1	120	100	80	90
2	80	90	110	70
3	110	140	120	100
4	90	90	80	90

Assign the programmers to the programmes in such a way that the total computer time gets minimized.

(OR)

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|----|---|----|----|-----|
| b) | On completing the construction of house a person discovers that 100 square feet of plywood scrap and 80 square feet of white pine scrap are available for the construction of tables and book cases. It takes 16 square feet of plywood 8 square feet of white pine to make a table, 12 square feet of plywood and 16 square feet of white pine are required to construct a book case. By selling the finishing duct to a local furniture store the person can realize a profit of Rs. 25 on each table and Rs. 290 on each book case. How may the man most profitably use the left over wood? Use graphical method to solve the problem. | 15 | K4 | CO1 |
|----|---|----|----|-----|