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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2025-26 ONLY)

SUBJECT CODE 25 PCO 207

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY– 2026

M.Com. **MAXIMUM MARKS: 75**

II SEMESTER **TIME : 3 HOURS**

OPERATION RESEARCH

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. Which of the following methods is used to solve Linear Programming Problems with more than two variables?
   A. Graphical method
   B. Simplex method
   C. Matrix method
   D. Hungarian method
2. Which method is used to obtain an initial basic feasible solution in a transportation problem?
   A. Vogel's Approximation Method
   B. MODI method
   C. Simplex method
   D. Maximin method
3. Which is used the minimax principle in game theory?
   A. Players cooperate
   B. There is a saddle point
   C. The game is non-competitive
   D. Pay-off matrix is rectangular
4. In which is represents the critical path in a project network?
   A. The shortest path
   B. The path with maximum cost
   C. The path with minimum slack
   D. The path with maximum slack
5. Which one is mainly used in Monte Carlo simulation Technique?
   A. Deterministic values
   B. Graphical techniques
   C. Linear equations
   D. Random numbers

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. What is simplex Method?
7. Specify the meaning of transportation problem?
8. How saddle point in a game plays an important role?
9. Expand the term PERT.
10. Recall the term Monte Carlo simulation .

(CONTD …. 2)

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K3)

11. a) Indicate the basic assumptions of Linear Programming .

(OR)

b) The cost of materials *A* and *B* is Re.1/- per unit respectively. We have to manufacture an alloy by mixing these to materials. The process of preparing the alloy is carried out on three facilities *X*, *Y* and *Z*. Facilities *X* and *Z* are machines, whose capacities are limited. *Y* is a furnace, where heat treatment takes place and the material must use a minimum given time (even if it uses more than the required, there is no harm). Material *A* requires 5 hours of machine *X* and it does not require processing on machine *Z*. Material *B* requires 10 hours of machine *X* and 1 hour of machine *Z*. Both *A* and *B* are to be heat treated at last one hour in furnace *Y*. The available capacities of *X*, *Y* and *Z* are 50 hours, 1 hour and 4 hours respectively. Find how much of *A* and *B* are mixed so as to minimize the cost.

12. a) Find the initial basic feasible solution for the following transportation problem, usingNorth-West Corner Rule method.

		Destination		
Sources ↓	**D1**	**D2**	**D3**	**Supply**
S1	3	8	5	**7**
S2	4	4	2	**8**
S3	6	5	8	**10**
S4	2	6	3	**15**
Demand	**8**	**10**	**22**	

(OR)

b) Solve the following assignment problem

		MEN		
		1	**2**	**3**
TASK	**P**	9	26	15
	Q	13	27	6
	R	35	20	15
	S	18	30	20

13. a) Solve the game given below:

		Player B		
		I	**II**	**III**
Player B	**I**	1	9	2
	II	8	5	4

(OR)

(CONTD …. 3)

b) Solve the game whose pay of matrix is:

		B		
		I	II	III
	I	–3	–2	6
A	II	2	0	4
	II	5	–2	–4
	I			

14. a) Difference between CPM and PERT

(OR)

b) For a certain project the data is given below. Identify the critical path and compute the minimum time required to complete the project.

Activity	1-2	1-4	1-7	2-3	3-6	4-5	4-8	5-6	6-9	7-8	8-9
Expected time (in months)	2	2	1	4	1	3	8	4	3	3	5

15. a) A coin is tossed. Probability of head = 0.6 and tail = 0.4. Simulate 10 trials using random numbers.

Random No	**Result**
15	H
32	H
68	T
45	H
72	T
25	H
91	T
55	H
39	H
80	T

(OR)

b) A machine costs ₹6000. Annual maintenance cost increases as follows:

Year	**Cost (₹)**
1	800
2	1200
3	1600
4	2200
5	3000

Find optimum replacement time. Scrap value = ₹1000.

(CONTD …. 4)

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) Enumerate the applications of LPP in Business Problems

(OR)

b) Solve the following LPP by simplex method,

Maximize $Z = 6x_1+9x_2$

Subjected to

$x_1+x_2 \leq 12$

$x_1+5x_2 \leq 45$

$3x_1+x_2 \leq 30$ and $x_1, x_2 \geq 0$.

17. a) Find the initial basic feasible solution for the following TP by VAM:

	D1	**D2**	**D3**	**D4**	**Supply**
S1	11	13	17	14	**250**
S2	16	18	14	10	**300**
S3	21	24	13	10	**400**
Requirement	**200**	**225**	**275**	**250**	

(OR)

b) Solve the following Assignment problem

	J1	**J2**	**J3**	**J4**	**J5**
A	-	3	6	2	3
B	3	-	5	2	3
C	6	5	-	6	4
D	2	2	6	-	6
E	3	3	4	6	-

18. a) Two players *P* and *Q* play the game. Each of them has to choose one of the three colours: White (*W*), Black (*B*) and Red (*R*) independently of the other. Thereafter the colours are compared. If both *P* and *Q* has chosen white (*W, W*), neither wins anything If player *P* selects white and Player *Q* black (*W, B*), player *P* loses Rs.2/- or player *Q* wins the same amount and so on. The complete payoff table is shown below. Find the optimum strategies for *P* and *Q* and the value of the game.

		Q		
		W	**B**	**R**
P	**W**	0	–2	7
	B	2	5	6
	R	3	–3	8

(OR)

(CONTD …. 5)

b) Solve the game whose payoff matrix is:

		B				
		1	2	3	4	5
	1	1	3	2	7	4
A	2	3	4	1	5	6
	3	6	5	7	6	5
	4	2	0	6	3	1

19. a) A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (*i*) and ending (*j*) node numbers.

Activities		***Time in weeks***		
I	***j***	t_o	t_l	t_p
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

1. Draw the network
2. Calculate the expected variances for each
3. Find the expected project completed time
4. Calculate the probability that the project will be completed at least 3 weeks than expected
5. If the project due date is 18 weeks, what is the probability of not meeting the due date?

(OR)

b) A small project has 7 activities and the time in days for each activity is given below:

Activity	***Duration in days***
A	6
B	8
C	3
D	4
E	6
F	10
G	3

Given that activities *A* and *B* can start at the beginning of the project. When *A* is completed *C* and *D* can start. *E* can start only when *B* and *D* are finished. *F* can start when *B, C* and *D* are completed and is the final activity. *G* can start when *E* is finished and is the final activity. Draw the network and find the project completion time.

(CONTD …. 6)

Activity	*Immediate predecessor*	*Time in days*
A	–	6
B	–	8
C	A	3
D	A	4
E	B, D	6
F	B, C or D	10
G	E	3

Draw the network and enter the times and find T_E.

20. a) Enumerate the advantages and disadvantages of simulation

(OR)

b) A coffee house in a busy market operates counter service. The proprietor of the coffee house has approached you with the problem of determining the number of bearers he should employ at the counter. He wants that the average waiting time of the customer should not exceed 2 minutes. After recording the data for a number of days, the following frequency distribution of inter-arrival time of customers and the service time at the counter are established. Simulate the system for 10 arrivals of various alternative number of bearers and determine the suitable answer to the problem.

Inter-arrival time in mins.	*Frequency (%)*	*Service time in mins.*	*Frequency (%)*
0	5	1.0	5
0.5	35	2.0	25
1.0	25	3.0	35
1.5	15	4.0	20
2.0	10	5.0	15
2.5	7		
3.0	3		

ETHICAL PAPER

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