(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2024 ONLY)

24PCC206

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY-2025

M.Com.-C.A   **MAXIMUM MARKS: 75**
SEMESTER: II   **TIME : 3 HOURS**

OPERATIONS RESEARCH

SECTION – A   **(10 X 1 = 10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS.   **(K1)**

1. The dual of a linear programming problem**:_____.**
   a. Has the same solution as the primal problem
   b. Exchanges the roles of the objective function and constraints
   c. Is always infeasible if the primal problem is feasible
   d. Is used only for graphical solutions

2. What is the sequencing problem with 'n' jobs and 2 machines focused on?
   a. Assigning tasks   b. Finding the order of jobs to minimize time
   c. Assigning workers to tasks   d. Calculating costs

3. What is the main objective of queuing theory?
   a. To maximize the queue length   b. To analyse and optimize waiting lines
   c. To increase service time   d. To eliminate queues entirely

4. In EOQ with a single price break, what does the price break represent?
   a. A discount given for ordering beyond a certain quantity
   b. A penalty for ordering less than a certain quantity
   c. The holding cost reduction for larger orders
   d. An increase in ordering costs

5. What is a "dummy activity" in a network diagram?
   a. An activity that requires no time or resources
   b. An activity that determines the project duration
   c. An activity with the highest cost
   d. An activity that always lies on the critical path

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.   **(K2)**
6. In the simplex method, what does a basic feasible solution represent?.
7. Explain an Assignment Problem
8. What are the key elements of a queuing system?
9. Define EOQ.
10. Explain the key difference between PERT and CPM?

SECTION – B   **(5 X 5 = 25 MARKS)**

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.   **(K3)**

11. a) A small firm manufactures necklaces and bracelets. The total number of necklaces and bracelets that it can handle per day is at most 24. It takes one hour to make a bracelet and half an hour to make a necklace. The maximum number of hours available per day is 16. If the profit on a necklace is ₹ 100 and that on a bracelet is ₹ 300. Formulate on L.P.P. for finding how many of each should be produced daily to maximize the profit? It is being given that at least one of each must be produced

(OR)

b) Convert the constraints into equations as per the principle of simplex using slack variables

Maximize $z = 3x_1 + 2x_2$
subject to
$-x_1 + 2x_2 \leq 4$
$3x_1 + 2x_2 \leq 14$
$x_1 - x_2 \leq 3$
$x_1, x_2 \geq 0$

12.a) Obtain the initial basic feasible solution of a transportation problem using Least Cost Method

FACTORIES	RETAIL SHOPS				supply
	D1	**D2**	**D3**	**D4**	
O1	3	5	7	6	50
O2	2	5	8	2	75
O3	3	6	9	2	25
Demand	20	20	50	60	

(OR)

b) Solve the following Assignment problem

	TASK			
PERSON	E	F	G	H
A	8	20	15	17
B	15	16	12	10
C	22	19	16	30
D	25	15	12	9

13.a) A T.V repairman repair the sets in the order in which they arrive and expects that the time required to repair a set has an ED with mean 30mins. The sets arrive in a Poisson fashion at an average rate of 10/8 hrs a day.
(a) What is the expected idle time / day for the repairman?
b) How many TV sets will be there waiting for the repair?
(OR)

b) The arrival rate for a waiting line system obeys a P.D with a mean of 0.5 units/hr. it is required that the probability of one or more units in the system does not exceed 0.25. What is the minimum service rate that must be provided if the service duration will be distributed exponentially?

14. a) A tier producer makes 1,600 tiers per day and sells them at approximately half that rate. Accounting figures show that the production set-up cost is Rs.1000 and carrying cost per unit is Rs.5. If the annual demand is 1, 60,000 tiers, what are the optimal lot size and how many production runs should be scheduled per year?
(OR)
b) A product is manufactured at the rate of 50 items per day. The demand occurs at the rate of 30 items per day. It is given that the set-up cost per order is `1000 and holding cost per unit time is `0.05. Find the economic lot size and the associated total cost per cycle assuming that no shortage is allowed.
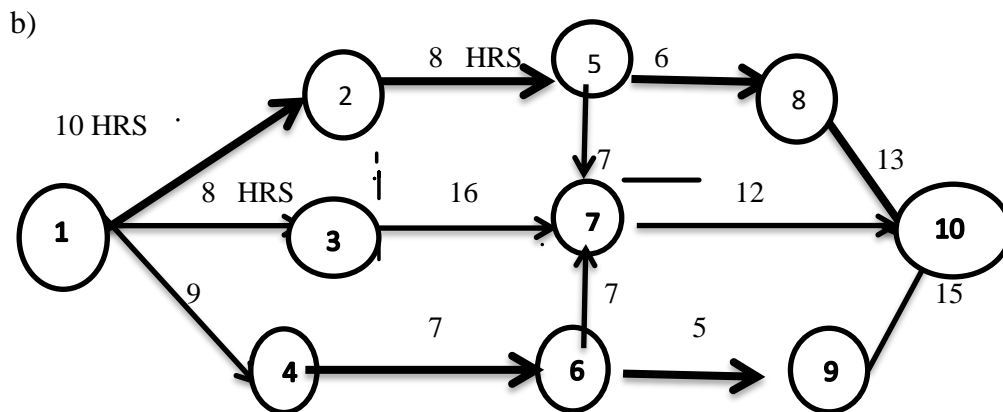
(CONTD …. 3)

15.a) Draw a network for a house construction project. The sequence of activities with their predecessors are given in table below.
Sequence of activities for house construction project

name of the activity	starting and finishing event	description of ACTIVITY	predecessor	time duration [days]
A	1,2	Prepare the house plan	--	4
B	2,3	construct the house		58
C	3,4	fix the door/windows	A	2
D	3,5	wiring the house	B	2
E	4,6	paint the house	C	1
F	5,6	polish the doors/windows	D	1

(OR)

b)

Determine the critical path through **forward pass method**

SECTION – C   **(5 X 8 = 40 MARKS)**
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
                         (K4 (Or) K5)

16. a) Solve the following LPP graphically:

Minimize, $Z = 5x + 10y$
subject to the constraints
$x + 2y \leq 120$
$x + y \geq 60,$
$x - 2y > 0$ and x, y ≥ 0

(OR)

Elaborate the various applications of operations research.

17.a) Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the machines I, II, III and IV.

machines

		I	II	III	IV
	A	10	12	19	11
Jobs	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

(OR)

b)   Obtain the initial basic feasible solution of a transportation problem using Vogel's

approximation method

Origin	Destination				supply
	D1	D2	D3	D4	
O1	3	1	7	4	300
O2	2	6	5	9	400
O3	8	3	3	2	500
Demand	250	350	400	200	1200

18. a)   At a one man barber shop customers arrive according to P.D with a mean arrival rate of
5/hr. The hair cutting time is ED with a hair cut taking 10 min on an average assuming
that the customers are always willing to wait find:
   i)   Average number of customer in the shop
   ii) Average waiting time of a customer
   iii) The percent of time an arrival can walk right without having to wait
   iv) The probability of a customer waiting more than 5mins
(OR)
18 b)   Explain the basic structure of queuing model and its characteristics.

19.a)   A company uses 100000 units of a particular item per year. Each item costs `2. The
production engineering department estimates the holding cost as 12.5% of the value of the
inventory per day. The replenishment rate is uniform at 500 units per day. Assuming 250
working days (for replenishment purpose),
   calculate the a) optimal set-up quantity; b) total cost on the basis of optimal policy; and c)
   optimal number of set-ups. determine the optimum purchase quantity with the ordering
   cost as Rs.175.
(OR)
   b)   An enterprise requires 1000 units per month. The ordering cost is estimated to be Rs. 50
per order. In addition to Re. 1, the carrying costs are 5% per unit of average inventory per
year. The purchase price is Rs.20 per unit. Find the economic lot size to be ordered and the
total minimum cost.

20. a) From the data given below construct a network and find the critical pathby calculating the Earliest Pass method

PROJECT SCHEDULE

ACTIVITY	TIME	ACTIVITY	TIME	ACTIVITY	TIME
1-2	4	3-5	6	6-8	1
1-3	1	4-9	5	7-8	2
2-4	1	5-6	4	8-10	5
3-4	1	5-7	8	9-10	7

(OR)

b) A project has the following characteristics

Activity	Most Optimistic Time To	Most Pessimistic Time Tp	Most Likely Time Tm
1-2	1	5	1.5
2-3	1	3	2
2-4	1	5	3
3-5	3	5	4
4-5	2	4	3
4-6	3	7	5
5-7	4	6	5
6-7	6	8	7
7-8	2	6	4
7-9	5	8	6
8-10	1	3	2
9-10	3	7	5

Construct a PERT network. Find critical path and variance for each event.

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ETHICAL PAPER