Reg. No. : .....

Code No. : 6847 **Sub. Code : PMAM 34**

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Third Semester

Core — Mathematics

OPERATIONS RESEARCH

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A feasible solution is called a basic feasible solution if the number of non-negative allocation is equal to

   (a) $m-n+1$ (b) $m-n-1$

   (c) $m+n-1$ (d) $m+n$

2. For maximization in TP, the objective is to maximize the total

   (a) solution (b) profit

   (c) profit matrix (d) demand

3. Which of the following is the correct answer?

(a) CPM is an improvement upon bar chart method

(b) CPM provides a realistic approach to daily problem

(c) CPM avoids delays which one very common in bar charts

(d) All the above

4. The performance of a specific task in CPM is known a

(a) Dummy (b) Event

(c) Activity (d) Contract

5. Which of the following is not correct?

(a) An IPP that has no constraints is known as a knapsack problem

(b) An IPP that has only one constraint is known as a knapsack problem

(c) Capital budgeting problems may be handled as a "0 – 1" type IPP

(d) A traveling salesman problem may be solved using branch and bound method

6. Branch and bound method divides the feasible solution space into parts by

(a) enumerating (b) branching

(c) bounding (d) all the above

7. What aims at optimizing inventory levels?

(a) Inventory control

(b) Inventory capacity

(c) Inventory planning

(d) None of the above

8. The minimum stock level is calculated as

(a) Reorder level – (normal consumption × normal delivery time)

(b) Reorder level + (normal consumption × normal delivery time)

(c) (Reorder level + normal consumption) × normal delivery time

(d) (Reorder level + normal consumption) / normal delivery time

9. Service mechanism in a queuing system is characterized by

(a) server's behaviour

(b) customers in the system

(c) customer's behaviour

(d) all of the above

10. The calling population is assumed to be infinite when

(a) arrivals are independent of each other

(b) capacity of the system is infinite

(c) service rate is faster than arrival rate

(d) all the above

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a)

	Denver	Miami	Supply
Los Angles	80	215	1000
Detroit	100	108	1300
New orleary	102	68	1200
Demand	2300	1400	

Suppose that for the case when the demand exceeds the supply, a penalty is levied at the rate of $200 and $300 for each undelivered car at Denver and Miami, respectively. Additionally, no deliveries are made from the Los angles plant to the Miami distribution center set up the model, and determine the optimal shipping schedule.

Or

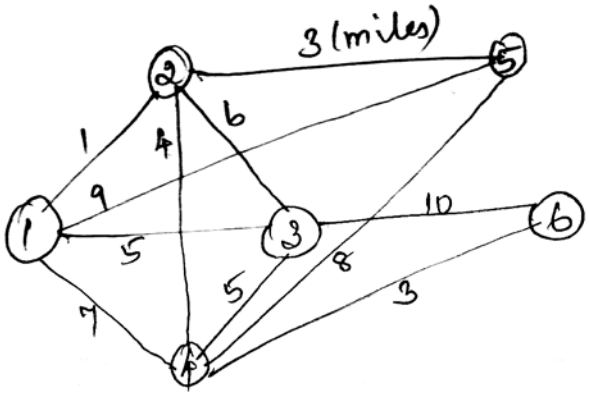
(b) Compare starting solutions obtained by the north-west corner and VAM for the model.

0	2	1	6
2	1	5	7
2	4	3	7
5	5	10	

12. (a) Determine the minimal spanning tree of the network given below under the conditions.

(i) Nodes 5 and 6 are linked by a 2-mile cable.

(ii) Nodes 2 and 5 cannot be linked.



Or

(b) Construct the project network comprised of activities A to P that satisfies the following precedence relationship.

(i) A, B and C, the first activities of the project, can be executed concurrently.

(ii) D, E and F follow A.

(iii) I and G follow both B and D.

(iv) H follows both C and G.

(v) K and L follow I.

(vi) J succeeds both E and H.

(vii) M and N succeed F, but cannot start until both E and H are completed.

(viii) O succeeds M and I.

(ix) P succeeds J, L and O.

(x) K, N and P are terminal activities of the project.

13. (a) Find optimum integer solution to the LPP.

Maximize $z = x_1 + 2x_2$

Subject to the constraints

$2x_2 \leq 7$, $x_1 + x_2 \leq 7$, $2x_1 \leq 11$, $x_1, x_2 \geq 0$ and are integers.

Or

(b) Explain Branch and Bound algorithm.

14. (a) Calculate the optimum level of inventory if the demand is instantaneous.

Weakly sales :	0	1	2	3
Probability :	0.01	0.06	0.25	0.35
Weakly sales :	4	5	6	
Probability :	0.20	0.03	0.10	

The cost of carrying inventory is Rs. 30/unit/week and the cost of unit shortage is Rs. 70 per week.

Or

(b) A contractor has to supply 10000 bearing 1 day to an automobile manufactures. He finds that when he starts a production run, he can produce 25000 bearings per day. The cost of holding a bearing in stock for one year is Rs. 2 and the set up cost of a production run is Rs. 1800. How frequently should production run be made?

15. (a) In a railway yard, goods trains arrive at rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 mins. Calculate (i) the mean queue size and (ii) the probability that the queue size exceeds 10.

Or

(b) Derive litter's formulae.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain Hungarian assignment method.

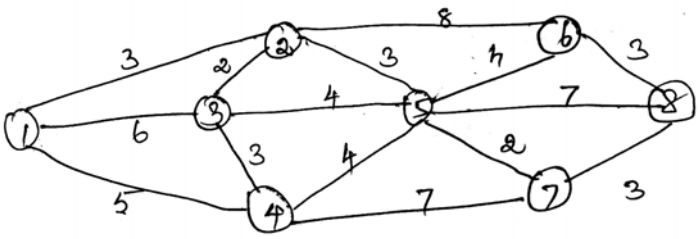
Or

(b)

	Men			
Task	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated, one to man so as to minimize the total man hours?

17. (a) Determine the shortest route from station 1 to station 8.



Or

(b) Distinguish CPM from PERT.

18. (a) Find the optimum integer solution to the I.P.P.

Maximize $z = x_1 + 4x_2$ subject to the constraints $2x_1 + 4x_2 \leq 7$, $5x_1 + 3x_2 \leq 15$, $x_1, x_2 \geq 0$ and are integers.

Or

(b) Use branch and bound method, solve

Maximize $z = 7x_1 + 9x_2$ subject to

$-x_1 + 3x_2 \leq 6$; $7x_1 + x_2 \leq 35$; $x_2 \leq 7$, $x_1, x_2 \geq 0$ and are integers.

19. (a) Determine the optimal order quantities.

item i	K_i	D_i (units/day)	h_i	a_i (ft²)
1	20	22	0.35	1.0
2	25	34	0.15	0.8
3	30	14	0.28	1.1
4	28	21	0.30	0.5
5	35	26	0.42	1.2

Total available storage area = 25 ft².

Or

(b) Lube can specializes in fast automobile oil change. The garage buys an oil in bulk at 3 per gallon. A discount price of 2.50 per gallon is available if Lube car purchases more than 1000 gallons. The garage services approximately 150 cars per day, and each oil change balls 1.25 gallons. Lube car stores bulk oil at the cost of 0.02 per gallon per day. Also, the cost of placing an order for bulk oil is 20. There is a 2-day lead time for delivery. Determine the optimal inventory policy.

20. (a) Explain pure death model.

Or

(b) Explain the model (M/M/C) : (GD/∞/∞).

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