Reg. No. : .....

Code No. : 7847 **Sub. Code : PMAM 34**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2019.

Third Semester

Mathematics – Core

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. To balance a transportation model, we need to add a ———

(a) dummy source

(b) dummy destination

(c) both (a) and (b)

(d) (a) but not (b)

space can hold only three cars. All other cars cannot park or find a temporary waiting space must go elsewhere. Determine the following:

(i) the probability p_n of n cars being in the system.

(ii) the effective rate at which cars arrive at the lot

(iii) the average number of cars in the lot.

———

2. The assignment model is a special case of _____ model

(a) transportation

(b) linear programming

(c) integer programming

(d) queuing

3. Dijkstra's algorithm is designed to determine the shortest routes between the source node and _____ node in the network

(a) destination (b) only one

(c) a particular (d) every other

4. While constructing the network, each activity must be identified by _____

(a) a unique node

(b) two distinct end nodes

(c) many end nodes

(d) any number of distinct and nodes

5. The elevation of the zero binary variables to level 1 occurs in the additive algorithm _____ at a time

(a) one (b) two

(c) many (d) all

6. _____ algorithm is the first special 0–1 algorithm

(a) binary

(b) zero–one

(c) additive

(d) multiplicative

7. An inventory policy answers the question "_____ to order?"

(a) How much (b) When

(c) Both (a) and (b) (d) None

8. In a classic EOQ model, D represents _____.

(a) Daily order quantity

(b) Demand rate

(c) Data rate

(d) Daily rate

9. $L_s =$ _____

(a) $L_q + \frac{\lambda_{eff}}{\mu}$ (b) $L_q - \frac{\lambda_{eff}}{\mu}$

(c) $L_q + \frac{1}{\mu}$ (d) $L_q - \frac{1}{\mu}$

10. In $(M/M/1):(GD/\infty/\infty)$ model, $\bar{c} =$

(a) L_s (b) L_q

(c) e (d) $1-e$

PART B — (5 × 5 = 25 marks)

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

11. (a) Find a starting solution by Least-cost method for the following transportation problem.

10	2	20	11	15
12	7	9	20	25
4	14	16	18	10
5	15	15	15	

Or

(b) Explain the Hungarian method to solve an assignment problem.

12. (a) Write the minimum spanning tree algorithm.

Or

(b) Explain the problem of most reliable route.

13. (a) I have been approached by three telephone companies to subscribe to their long-distance service in the United states. MaBell with charge a flat \$16 per month plus \$0.25 a minute. PaBell will charge \$25 a month but \$0.21 per minute, where as BabyBell, the flat monthly charge is \$18 and the cost per minute is \$0.22. I usually make an average at 200 minutes of long-distance calls a month. Assuming that I do not pay the flat monthly fee unless I make calls and that I can apportion my calls among all three companies as I please, how should I use the three companies to minimize my monthly telephone bill?

Or

(b) Write the Branch-and-Bound algorithm.

14. (a) What are the costs involved in inventory model? Explain them.

Or

(b) Given that $EOQ = 1000$, $D = 100$, $\sigma = 10, \alpha = 0.05$ and $L = 2$. Find μ_L, σ_L and the lower limit of buffer size.

15. (a) Explain the role of exponential distribution in queuing systems.

Or

(b) Discuss the pure birth model.

PART C — (5 × 8 = 40 marks)

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

16. (a) Solve the transportation problem:

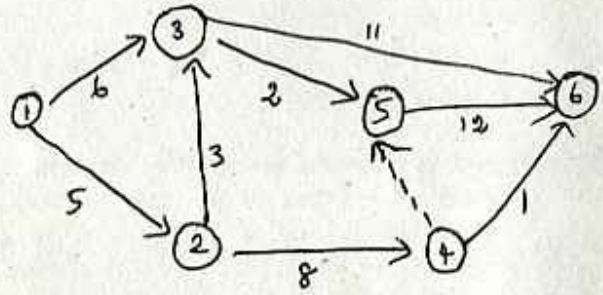
0	2	1	6
2	1	5	9
2	4	3	5
5	5	10	

Or

(b) Solve the assignment problem.

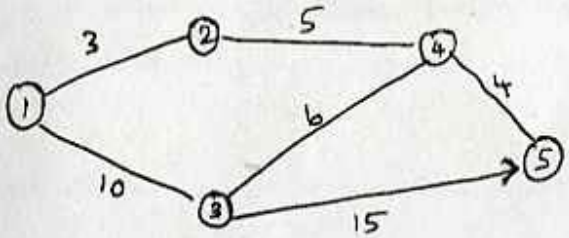
3	8	2	10	3
8	7	2	9	7
6	4	2	7	5
8	4	2	3	5
9	10	6	9	10

17. (a) Determine the critical path for the project network given below. All the durations are in days.



Or

(b) For the network given below, find the shortest routes between every two nodes (3, 5) is directional so that no traffic is allowed from node 5 to node 3. All the other arcs allow traffic in both directions.



18. (a) Explain the set covering problem.

Or

(b) Demonstrate graphically how the cutting plane algorithm may be used to solve the following ILP: Maximize $z = 7x_1 + 10x_2$ subject to $-x_1 + 3x_2 \le 6$, $7x_1 + x_2 \le 35$, $x_1, x_2 \ge 0$ and integer.

19. (a) Lube car specializes in fast automobile oil change. the garage buys car oil in bulk at \$3 per gallon. A price discount of \$2.50 per gallon is available if Lube Car puchases more than 1000 gallons. The garage services approximately 150 cars per day and each oil change requires 1.25 gallons. Lube car stores bulk oil at the cost \$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.

Or

(b) Electro uses resin in its manufacturing process at the rate of 1000 gallons per month. It cost electro \$100 to place an order for a new shipment. The holding cost per gallon per month is \$2, and the shortage cost per gallon is \$10. Historical data show that the demand during lead time is uniform over the range (0,100) gallons. Determine the optimal ordering policy for Electro.

20. (a) Explain the model $(m/m/1):(GD/\infty/\infty)$.

Or

(b) Visitors parking at Ozark college is limited to only five spaces. Cars making use of this space arrive according to a Poisson distribution of the rate of six cars per hour. Parking time is exponentially distributed with a mean of 30 minutes. Visitors who cannot find an empty space immediately on arrival may temporarily wait inside the lot until a parked car leaves. That temporary