Avinashilingam Institute for Home Science and Higher Education for Women
Comibatore-641 043
Master's Degree Examination –November 2017
I Semester

Class : I PG
Major: Mathematics

Max. Marks: 60
Time: 3 Hours

17MMAC04 Optimization Techniques

Part A

Choose the correct Answer **10x½=5**

1. If the average inventory level is y/2, the total cost per unit time TCU is,
   a) $\frac{k}{(D/y)} + h\,(y/2)$ b. $\frac{k}{(y/D)} + h(y/2)$ c. $\frac{k}{(h/D)} + h\,(y/2)$ d. $\frac{k}{(D/h)} + h\,(y/2)$
2. The cost of carrying inventory is called ----------
   a) Holding cost b. Shortage cost c. Setup cost d. Purchase cost
3. In a deterministic inventory setup model feasible range for z_1 when $x_1=0, D_1=5, D_2=3$ and $D_3=4$ is
   a) $0 \le z_1 \le 9$ b) $0 \le z_1 \le 5$ c) $5 \le z_1 \le 14$ d) $2 \le z_1 \le 3$
4. In Probilitized EOQ model, the notation 'σ' denotes
   a. Random variable representing demand during lead time
   b. Average demand during lead time
   c. Standard deviation of demand during lead time
   d. Buffer stock size
5. The original classical name of newsvendor model is ---------- model.
   a. retailer b. newsboy c. shortage d. corporate
6. The first random number by multiplication congruential method, when b=9, c=5, m-12 and u_0= 11, then R_1 is ----------.
   a. 5/12 b. 8/12 c. 2/12 d. 3/12
7. The method not used for generating successive random samples form a probability distribution is,
   a. Inverse method b. Convolution method
   c. Acceptance-rejection method d. Generation function method
8. In Erlang distribution m=3 and λ=4/hr, R_1 =0.0589, R_2=0.6733, R_3=0.4799 then y is,
   a) 0.881 hr b) 0.991 hr c) 0.781 hr d)0.871 hr
9. What is the condition, if y_0 is a minimum point of f (x),
   a) $f^{11}(y_0) > 0$ b) $f^{11}(y_0) < 0$ c) $f^{1}(y_0) > 0$ d) $f^{1}(y_0) < 0$
10. For the function $f(y)=y^4$ the inflection point is ----------
    a) 0 b) 1 c) 2 d) 3

PART -B (5X4=20 MARKS)

Answer the following

Each answer should not exceed 200 words or one page.

11. a) Show that the optimum inventory policy for the classic EOQ model is $y^* = \sqrt{\frac{2KD}{H}}$

(Or)

a) Neon lights on the U of A campus are replaced at the rate of 100 units per day. The physical plant orders the neon lights periodically. It costs $100 to initiate a purchase order. A neon light kept in storage is estimated to cost about $0.02 per day. The lead time between placing and receiving an order is 12 days. Determine the optimal inventory policy for ordering the neon lights?

12. a. Explain General Dynamic programming Algorithm.

(Or)

b. Find the optional solution for the following three periods inventory model.

Period I	Demand Di (Units)	Setup cost k_i ($)	Holding cost h_i ($)
1	3	3	1
2	2	7	3
3	4	6	2

The unit production cost is $10 for the first 3 units and $20, for each additional unit.

13. a) Explain Newsvendor Model.

(Or)

b)The daily demand for an item during a single period occurs instantaneously at the start of the period. The pdf of the demand is uniform between 0 and 10 units. The unit holding cost of the item during the period is $0.50, and the unity penalty cost for running out of stock is $4.50. The unit purchase cost is $0.50.A fixed cost of $25 is incurred each time an order is placed. Determine the optimal inventory policy for the item?

14. a. Explain the types of Simulation.

(Or)

c. Explain the Poisson Distribution.

15. a. Explain Lagrangean Method.

(Or)

b. Prove that if the sufficient condition for a stationery point 'X_0' to be an extremum is that the Hessian matrix. H evaluated at X_0 satisfy 'H' is postitive definite if 'X_0' is a minimum point.

PART -C (5X7=35 MARKS)

Answer the following

Each answer should not exceed 600 words or three pages.

16. a) Lubecar specializes in fast automobile oil change. The garge buys car oil in bulk at $ 3 per gallons. A price discount of $ 2.50 per gallon is available if 'Lubecar purchases more than 1000 gallone. The garage services approcimately 150 cars per day, and each oil change requires 1.25 gallons. Lubecar 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. These is a 2-day lead time for delivery. Determine the optimal inventory policy.

(Or)

b.) Explain classical EOQ model.

17. a) Metalco produces draft deflectors for use in home fire place during the month of December to March. The demand starts slow, peaks in the middle of the season, and tapers off toward the end. Because of the popularity of the product metalco may use overtime to satisfy the demands. The following table provides the production capacities and the demand for four winter months.

Month	Capacity		Demand (Units)
	Regular (Units)	Overtime (Units)	
1	90	50	100
2	100	60	190
3	120	80	210
4	110	70	160

Unit production cast in any period is \$6 during regular time and \$ 9 during overtime. Holding cost per unit per month is \$ 10. Find to optimal solution.

(Or)

(b) A Four-period inventory model operales with the following data.

Period i	Demand Di (Units)	Setup cost k_i (\$)
1	76	98
2	26	114
3	90	185
4	67	70

The initial inventory x_1=15 units, The unit production cost is \$2, and the unit holding cost per period is \$ 1, for all the periods. Find the optimal policy for the above model.

18. a) The owner of a news stand wants to determine the number of USA. Now newspapers that must be stocked at the start of the each day. It cost 30 units to buy a copy and the owner sells it for 75 cents. The sale of the newspaper left at the end of the day are recycled for an income of 5 cents a copy. How many copies should the owner stock every morning, assuming that the demand for the day can be approximately by,

a) A normal distribution with mean 300 copies and standard deviation 20 copies.

(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.

19. a) Explain: Beta distribution

(Or)

b) Explain: The various method in sampling from probability distributions with examples.

20. a) Cosider the problem

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

Subject to $g_1(x) = x_1 + x_2 + 3x_3 - 2 = 0$

$g_2(x) = 5x_1 + 2x_2 + x_3 - 5 = 0$

Determine the constrained extreme points.

(Or)

b) Solve by Jacobian method,

Max $Z = 2x_1 + 3x_2$

Subject to,

$x_1 + x_2 + x_3 = 5$

$x_1 - x_2 + x_4 = 3$

$x_1, x_2, x_3, x_4 \geq 0.$