



ID NO.	
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PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Weightage: 40 %

Max Marks: 80

Max Time: 2 hrs.

07 May 2018, Monday

ENDTERM FINAL EXAMINATION MAY 2018

Even Semester 2017-18

Course: **MEC 220 Operations
Research for Engineers**

VI Sem. Mechanical

Instructions:

- (i) Read the question properly and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and Non-programmable calculators are permitted
 - (iv) Normal distribution table is permitted
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Part A

(4 Q x 5 M = 20 Marks)

1. A company wants to introduce a new product in place of an old one. It is to be decided whether the price is to be fixed as very high, moderate or slightly increased (H or M or S). Three possible outcomes are expected which are increase in sales, no change in sales or decrease in sales (I or N or D). The expected sales are given in the following table (in lakhs of rupees)

Strategies	Events		
	I	N	D
H	70	30	15
M	50	45	0
S	30	30	30

Which alternative should be chosen according to Laplace criteria?

2. Mr. Girish wants to invest Rs.10000 in one of the three options A, B and C. The payoff for his investment depends on the nature of the economy (inflation, recession or no change). The possible returns under each economic situation are given below

Strategies	Nature of economy		
	Inflation	Recession	No change
A	2000	1200	1500
B	3000	800	1000
C	2500	1000	1800

Which action he should take according to Minimax regret criteria?

- Customers arrive at box office window with a single server, at a mean rate of 30 per hour. The time required to serve a customer is 90 seconds on the average. Find the expected waiting time of a customer in queue and average queue length.
- Construct the network diagram for the project whose activities and their relationships are given below
 $A < B, C$; $C < G, F$; $D < G, F$; $E, F < H$.

Part B

(3 Q x 10 M = 30 Marks)

- A business man buys an item at Rs.8 and sells it at Rs.12. Unsold items are useless. The following table gives the sales details for the past 100 days.

Number of items sold	25	26	27	28	29
Number of days	10	10	25	40	15

Using EMV criteria, determine how many items he has to purchase in order to maximize his profit.

- A single server coffee shop has space to accommodate only 4 customers (including customers being served). If a new customer finds that the shop is full he goes to another shop. The arrival rate is 10 per hour and service rate is 5 minutes per customer. Find the expected waiting time in queue and average number of customers in system.

7. A tax consulting firm has 4 service counters. On the average 80 persons arrive during a day of 8 hours. The average service time per person is 20 minutes. Find the average number of customers in queue and expected waiting time in system.

Part C

(2Q x 15 M = 30 Marks)

8. The following table gives the tasks of a project and their durations in days

Task	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

A<D,E; B,D<F; C<G; B<H; F,G,H<I

Draw the network diagram. Find the critical path and project completion time.

9. For the following data, draw the network diagram, calculate the expected time of completion and find the probability of completing the project in 50 weeks.

Activity	Time estimates in weeks		
	t_o	t_m	t_p
A	4	6	8
B	5	7	15
C	4	8	12
D	15	20	25
E	10	18	26
F	8	9	16
G	4	8	12
H	1	2	3
I	6	7	8

Precedence relationships:

A<B,C; B<D,E; C<F; E<G; D,F<H; G,H<I.



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SCHOOL OF ENGINEERING

Weightage: 20%

Max Marks: 40

Max Time: 1 hr.

31 March Saturday 2018

TEST – 2

SET B

Even Semester 2017-18

Course: **MEC 220 Operations Research for Engineers**

VI Sem. Mechanical

Instruction:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted

Part A

(2 Q x 6 M = 12 Marks)

- 1. What are the benefits of inventory? Explain with the neat sketch the tradeoff between the costs.
- 2. Select the alternative action for given decision problem with the help of
 - a) Maximin criteria
 - b) Laplace criteria

Alternative action	Events		
	A	B	C
X	3	3	7
Y	4	3	2
Z	2	5	3

Part B

(2Q x 6 M = 12 Marks)

- 3. Derive an expression for “Economic Order Quantity” i.e. EOQ (Q^*) for instantaneous replenishment model without shortages.
- 4. Select the alternative action for given decision problem with the help of “Minimax Regret criteria”.

Alternative action	Events		
	A	B	C
X	2000	1200	1500
Y	3000	800	1000
Z	2500	1000	1800

Part C

(2Q x 8 M = 16 Marks)

5. A commodity is to be supplied at the rate of 300 units per day. Ordering cost is Rs.40 and the holding cost is Rs.1.5 per day. The delay in supply induces a penalty of Rs.7 per unit per day. Find the optimum policy and the reorder cycle period.
6. The sales of cakes in a bakery during 100 days has the following distribution:

Sales per day:	25	26	27	28
No. of days	10	30	50	10

The cost of cake is Rs.3 and it is sold at Rs.5. Unsold cakes are given to the poor people free of cost. Apply "Expected Monetary Value (EMV) criteria" to decide the number of cakes to be stocked at the beginning of the day.



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Weightage: 20 %

Max Marks: 40

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24 Feb Saturday 2018

TEST – 1

Even Semester 2017-18 Course: **MEC 220 Operations Research for** VI Sem. Mechanical
Engineers

Instruction:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted

Part A

(3 Q x 4 M = 12 Marks)

1. Solve graphically Maximize $Z = 100x_1 + 80x_2$ subject to the constraints

$$5x_1 + 10x_2 \leq 50$$

$$8x_1 + 2x_2 \geq 16$$

$$3x_1 - 2x_2 \geq 6$$

$$x_1, x_2 \geq 0$$

2. Write down the dual of the Linear Programming problem

Minimize $Z = 8x_1 + 2x_2$ subject to the constraints

$$5x_1 + 4x_2 \geq 24$$

$$3x_1 + 7x_2 \geq 46$$

$$4x_1 + 5x_2 \geq 48$$

$$x_1, x_2 \geq 0$$

3. Obtain an initial feasible solution using “North West Corner rule”. Also find the total cost of transportation.

Source/Destination	D1	D2	D3	D4	Availability
S1	1	2	3	4	6
S2	4	3	2	0	8
S3	0	2	2	1	10
Demand	4	6	8	6	

Part B

(2Q x 8 M = 16 Marks)

4. Using "Simplex Method" Maximize $Z = x_1 + x_2 + 3x_3$ subject to the constraints

$$3x_1 + 2x_2 + x_3 \leq 3$$

$$2x_1 + x_2 + 2x_3 \leq 2$$

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

5. Using "Big M Method" Minimize $Z = 5x_1 + 4x_2$ subject to the constraints

$$x_1 - 2x_2 \leq 1$$

$$x_1 + 2x_2 \geq 3$$

$$x_1, x_2 \geq 0$$

Part C

(1Q x 12 M = 12 Marks)

6. Find the optimum cost of transportation with the help of Modified distribution method. Generate an initial feasible solution using Vogel's Approximation Method.

Source/Destination	D1	D2	D3	D4	Availability
S1	11	20	7	8	50
S2	21	16	10	12	40
S3	8	12	18	9	70
Demand	30	25	35	40	