Consider the following sequence of random numbers:

48,78,19,51,56,77,15,14,68,09

Using this sequence, simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

Or

(b) A company manufacturing scooters produces about 100 scooters a day. Due to the availability of raw materials and other conditions deviations occur. The production is described by the following probability distribution.

Production per day	96	97	98	99	100
Probability	0.06	0.08	0.11	0.15	0.20
Production per day	101	102	103	104	
Probability	0.15	0.11	0.08	0.06	

The finished scooter are transported in a boat which has space for only 100 scooters. What will be the average number of scooters waiting in the factory and what will be the average number of empty spaces on the boat?

———————

Reg. No. : .....

Code No. : 5465 **Sub. Code : KBAM 33/ PBAM 31**

M.B.A. (CBCS) DEGREE EXAMINATION, NOVEMBER 2019.

Third Semester

Business Administration

OPERATIONS RESEARCH

(For those who joined in July 2016 and afterwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Operations research deals with ————————

(a) Theoretical problems

(b) Pure research into operations

(c) Real-world problems

(d) Military problems only

2. The graphical method of LP problem uses

(a) Objective function equation

(b) Constraint equations

(c) Linear equation

(d) All the above

3. Which of the following transportation techniques does not emphasize on cost control?

(a) North-west corner rule

(b) Least cost method

(c) Vogel's approximation method

(d) All the above

4. The method used for solving an assignment problem is called

(a) Reduced matrix method

(b) MODI method

(c) Hungarian method

(d) None of these

5. Activities with zero slack

(a) Can be delayed

(b) Must be completed first

(c) Lie on a critical path

(d) Have no predecessors

6. Which of the following is always true about a critical activity?

(a) LS=EF (b) LF=LS

(c) ES=LS (d) EF=ES

7. Two-person zero-sum game means that the _____

(a) Sum of losses to one player equals the sum of gains to other

(b) Sum of losses to one player is not equals the sum of gains to other

(c) Both (a) and (b)

(d) None of the above

8. Game theory models are classified by the _____

(a) Game inversion

(b) Rotation reduction

(c) Dominance

(d) Game transpose

9. _____ is a method of solving decision-making problems by designing, constructing, and manipulating a model of the real system.

(a) Simulation

(b) PERT

(c) CPM

(d) Sensitivity technique

10. _____ models deal with time varying interaction.

(a) Dynamic models

(b) Static models

(c) Probabilistic models

(d) Deterministic models

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) What are the characteristics of operations research?

Or

(b) List out the limitations of Operations research.

12. (a) Solve the following transportation problem using North-West corner method.

	D	E	F	G	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

Or

(b) Solve the following Assignment problem.

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

13. (a) Consider the data of the project, Find its critical path and project duration:

Activity:	A	B	C	D	E	F	G	H	I
Predecessor:	-	-	A	B	C,D	B	E	E	F,G
Duration:	4	7	2	9	6	5	2	10	4

Or

(b) A project consists of eight activities with the following relevant information:

Activity:	A	B	C	D	E	F	G	H
Predecessor:	-	-	-	A	B	C	D,E	F,G
Optimistic Time:	1	1	2	1	2	2	3	1
Most likely Time:	1	4	2	1	5	5	6	2
Pessimistic Time:	7	7	8	1	14	8	15	3

Draw the PERT network and Find out the expected project completion time.

14. (a) Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity	Unit Cost (Rs.)
$0 \le Q_1 < 500$	10.00
$500 \le Q_2 < 750$	9.25
$750 \le Q_3$	8.75

The monthly demand for the product is 200 units, the cost of storage is 2% of the unit cost and the cost of ordering is Rs 350.

Or

(b) A company has a steady demand of a product of 40 items per month. The purchase cost is Rs. 6 per item and the cost of ordering and procuring the material is Rs. 15 per occasion. If stock-holding cost is 20% per annum, how frequently should the company replenish the stock?

15. (a) Write a short note Monte Corlo simulation.

Or

(b) What are the applications of simulation?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Use penalty (or Big M) method to

Maximize $z = x_1 + x_2 + 2x_3 + 3x_3 - x_4$ subject to constraints:

$x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20,$

$x_1 + 2x_2 + x_3 + x_4 = 10$

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

Or

(b) Use the graphical method to solve the following L.P.P.

Maximize $z = 2x_1 + 3x_2$; subject to constraints;

$x_1 + x_2 \leq 30$

$x_1 - x_2 \geq 0,$

$x_2 \geq 3$

$0 \leq x_1 \leq 20$

$0 \leq x_2 \leq 12$

17. (a) An oil corporation has got three refineries P,Q and R and it has to send petrol to four different depots A,B,C and D The cost of shipping 1 gallon of petrol from each refinery to each depot is given below. The requirements of the depots and the available petrol at the refineries are also given. Find the minimum cost of shipping after obtaining an initial solution by Vogel,s Approximation Method.

Refinery	Depot A	B	C	D	Available
P	10	12	15	8	130
Q	14	11	9	10	150
R	20	5	7	18	170
Required	90	100	140	120	

Or

(b) Solve the following travelling salesman problem so as to minimize the cost per cycle:

From \ To	A	B	C	D	E
A	-	3	6	2	3
B	3	-	5	2	3
C	6	5	-	6	4
D	2	2	6	-	6
E	3	3	4	6	-

18. (a) The following table lists the jobs of a network along with their time estimates:

Job		Duration (days)		
i	j	Optimistic	Most likely	Pessimistic
1	2	3	6	15
1	6	2	5	14
2	3	6	12	30
2	4	2	5	8
3	5	5	11	17
4	5	3	6	15
6	7	3	9	27
5	8	1	4	7
7	8	4	19	28

(i) Draw the project network;

(ii) Calculate the length and variance of critical pate: and

(iii) What is the approximate probability that the jobs on the critical path will be completed in forty — one days?

Or

(b) A project consists of a series of tasks labeled A, B,....., H, I with the following relationships (W <X, Y means X and Y cannot start until W is completed: X,Y <W means W cannot start until both X and Y are completed etc). With this notation, construct the network diagram having the following constraint:
$A < D,E; B,D < F; C < G; B < H; F,G < I$.

19. (a) Solve the following games and determine the value of the game.

$$Sp_1 = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$$

$$Sp_2 = \begin{bmatrix} 2 & 5 \\ 7 & 3 \end{bmatrix}$$

Or

(b) An oil engine manufacturer purchases lubricants at the rate of Rs. 42 per piece from a vendor. The requirement of these lubricants is 1,800 per year. What should be the order quantity per order, if the cost per placement of an order is Rs. 16 and inventory carrying charge per rupee per year is only 20 paisa.

20. (a) Bright Bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given here:

Daily Demand :	0	10	20	30	40	50
Probability :	.01	.20	.15	.50	.12	.02