CA 4808 RESOURCE MANAGEMENT TECHNIQUESSET 1

PART A

Answer ALL Questions   **(10 X 2 = 20)**

1. What are slack and surplus variables?
2. In simplex method, what is the condition that al.p.p has unbounded solution?
3. Give the steps of North-West Corner rule.
4. Give mathematical formulation of assignment problem
5. What do you mean by decision making under conditions of uncertainty?
6. What is two-person zero-sum game?
7. Define the terms: i. Free float ii. Total float
8. State True or False the following:
i. Independent Float $\leq$ Free Float $\leq$ Total Float
   ii. For a critical activity, Free Float is zero.
9. What is queue behaviour?
10. What is busy time in single server queuing model? What will happen when it exceeds 1?

PART B
Answer ALL Questions   **(5 X 8 = 40)**

11a. Solve graphically the following:

Maximize $z = 6x_1 + 9x_2$

Subject to $x_1 + x_2 \leq 12$

$x_1 + 5x_2 \leq 45$

$3x_1 + x_2 \leq 30$

$x_1, x_2 \geq 0$

(or)

11b. Solve graphically the following linear programming problem.

Maximize $Z = 3x_1 + 5x_2$

Subject to $4x_1 + 3x_2 \leq 12$

$x_1 + 4x_2 \leq 4$

$2x_1 + 5x_2 \leq 10$

$x_1, x_2 \geq 0$

12a. A company has plants at P1, P2, and P3 which supply to warehouses at W1, W2, W3 and W4.Weekly factory production capacities of plants, the warehouse capacities to store the products and the cost of transportation are given in the following table: Find the initial allocation by VAM

Warehouse→ Plant↓	W1	W2	W3	W4	Supply
P1	25	17	25	14	600
P2	15	10	18	24	400
P3	16	20	8	13	600
Requirement	300	300	500	500	

(or)

12b. A secretary of a school is taking quotations from bus companies on 5 school bus routes which is given below:Which route gives minimum expenditure?

Route→ Company↓	1	2	3	4	5
1	4000	5000	-	-	4000
2	-	4000	-	4000	5000
3	3000	-	2000	-	6000
4	-	-	4000	5000	3000
5	5000	3000	6000	-	-

13a. i. Define the terms: (a) Laplace criterion   (b)   Hurwicz criterion

ii.   A retailer purchases newspaper everyday and sells on the same day. Any unsold item will be a loss for him. The daily demand for newspaper is in the range of 15, 16, 17, and 18 with respective probabilities 0.1, 0.2, 0.4, and 0.3 . How many papers should the retailer order to maximize the profit? The payoff matrix is given below:

Action→ Event↓	Probability	15	16	17	18
15	0.1	225	200	175	150
16	0.2	225	240	215	190
17	0.4	225	240	255	230
18	0.3	225	240	255	270

(or)

13b.   Solve the game whose payoff matrix is given below:

Player B→ Player↓	B1	B2	B3	B4
A1	2	-2	4	1
A2	6	1	12	3
A3	-3	2	0	6
A4	2	-3	7	1

14a. Given the following information

Activity	A	B	C	D	E	F	G	H
Predecessor Activity	-	-	-	A	B	C	D, E	F, G
Duration (days)	6	8	5	3	1	10	4	12

  i.   Draw the network diagram
  ii.   Identify the critical path and total project duration
  iii.   Determine Total, free and independent floats.

<div align="center">(or)</div>

14b. A project consists of 7 activities. The time estimate are in days.

Activity	A	B	C	D	E	F	G
Predecessor	---	A	A	C	B	D,E	F
T_O	1	2	3	4	3	2	7
T_M	4	5	3	10	9	5	7
T_P	7	20	3	22	15	14	7

  i.   Draw the PERT network diagram and find the critical path.
  ii.   Find the expected length of the critical path and its variance.

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15a. At a one-man barber shop, customers arrive according to Poisson distribution with a mean of 5 per hour and service is exponential with mean of 10 minutes. If it is assumed that customers are willing to wait, then find the following:
  i.   average number of customers in the shop and average no. of customers waiting
  ii.   the % of time a customer can walk in without having to wait
  iii.   Average waiting of a customer in the shop.

<div align="center">(or)</div>

15b. Customers arrive at a bank manned by single clerk according to Poisson distribution with mean rate of 10 per hour. Time requires to service a customer follows an exponential distribution with a mean of 4 minutes. Find the average number in the system. Average waiting time of customers in the queue. The probability that there will be exactly 2 customers in the queue.

PART C

Answer any TWO Questions   (2 x 20 = 40)

16a Minimize $Z = x_1 - 3x_2 + 2x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$

16b. Write the steps of VAM algorithm in Transportation Problem.

17a. . A company has 3 production centers and 4 warehouses. The production capacity at each center and storing capacity at each warehouse and the unit cost of transport from a center to a warehouse are given it the following matrix. Find the minimum transportation cost.

Warehouse→ Production center↓	W1	W2	W3	W4	Availability
C1	19	30	50	10	7
C2	70	30	40	60	9
C3	40	8	70	20	18
Requirement	5	8	7	14	

17b. Give the steps of Hungarian method in Assignment Problem.

18a. What are the characteristics of queuing system?

18b. A bank has two Tellers. First Teller handles withdrawals only and the second Teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawals are both exponential distribution with mean 3 minutes per customer. Depositors are found to arrive with a mean arrival rate of 16 per hour and withdrawers arrive at the rate of 14 per hour. What would be the effect on the average waiting time for depositors and withdrawers if each Teller can handle both deposits and withdrawals