5 A book binder has one printing press, one binding **12.5** machine and the manuscripts of the number of different books. The time required performing the printing; binding and finishing for each book are known. Determine the order in which the books should be processed in order to minimize the total time required to process the entire books. Also Find the total time required :

	Processing time (in min)				
Book	1	2	3	4	5
Printing Time	40	90	80	60	50
Binding Time	50	60	20	30	40
Finishing Time	80	100	60	70	100

6 At a one man barber shop. customers arrive **12.5** according to Poisson distribution with a mean arrival rate of 5 per hour and the hair cutting time is exponentially distributed, with an average hair cut taking 10 minutes. It is assumed that because of his excellent reputation, customers are always willing to wait. Calculate the following :

(i) Average number of customers in the shop and the average number of customers waiting for the hair cut

(ii) the percent of time an arrival can walk right in without having to wait

(iii) The percentage of customers who have to wait prior to getting into the barber's chair.

OR

6 Discuss importance and applications of CPM and **12.5** PERT techniques in project planning and control.

M. B. A.

(SEM. II) EXAMINATION, 2008-09

OPERATIONS RESEARCH

Time : 3 Hours]   *[Total Marks : 100*

Note :   Question paper consists of three parts. All questions are compulsory.

SECTION - I

1 Attempt all 20 parts of the following. Choose the correct answer and write its serial order in the answer book :

(i) Which decision making criterion involves choosing the course of action which minimizes the maximum opportunity loss ?

    (a) The maximin criterion

    (b) The minimax regret criterion

    (c) The maximax criterion

    (d) The expected value criterion

(ii) Which of the following is not part of a decision tree ?

    (a) Decision point   (b) Dummy activity

    (c) Branch   (d) Uncertainty node

(iii) Which of the following statements about decision trees is not true ?

(a) A decision point is represented by a square node

(b) Each route through the tree represents one possible combination of decisions and uncontrollable events

(c) A payoff can be assigned to each route through the tree

(d) A decision tree is only appropriate when there is only one decision to make and one set of uncontrollable events.

(iv) Which of the following criteria is not used for decision - making under uncertainty ?

(a) Maximin   (b) Maximax

(c) Minimax   (d) Minimize expected loss

(v) All linear programming problems have all of the following properties EXCEPT

(a) A linear objective function that is to be maximized or minimized

(b) A set of linear constraints

(c) Alternative optimal solutions

(d) Variables that are all restricted to nonnegative values

(vi) A constraint that does not affect the feasible region is a

(a) Non-negativity constraint

(b) Redundant constraint

(c) Standard constraint

(d) Slack constraint

(vii) Which of the following statements is NOT true ?

(a) A feasible solution satisfies all constraints

(b) An optimal solution satisfies all constrains

(c) An infeasible solution violates all constraints

(d) A feasible solution point does not have to lie on the boundary of the feasible region.

(viii) Infeasibility means that the number of solutions to the linear programming models that satisfies all constraints is

(a) at least 1   (b) 0

(c) an infinite number   (d) at least 2.

Use the following to answer question IX

	Maggy picks Blue	Maggy picks Green
Steven pick Blue	Maggy : Rs. 7 Steven : Rs. 5	Maggy : Rs. 5 Steven : Rs. 8
Steven Picks Green	Maggy : Rs. 6 Steven : Rs. 6	Maggy : Rs. 10 Steven : Rs. 12

(ix) In game above, the dominant strategy for Steven is :

(a) to pick blue

(b) to pick green

(c) depends on Mindy's choice

(d) there is no dominant strategy.

(x) Game theory is :

(a) A general theory of strategic behaviour

(b) The economic theory underlying competition between perfectly competitive firms

(c) The study of how monopolistically competitive firms behave in situations

(d) All of the above.

(xi) A common assumption about the players in a game is that

(a) Neither player knows the payoff matrix

(b) The players have different information about the payoff matrix

(c) Only one of the players pursues a rational strategy

(d) The specific identity of the players is irrelevant to the play of the game.

(xii) In a zero-sum game

(a) What one player wins, the other loses

(b) The sum of each player's winning if the game is played many times must be zero

(c) The game is fair-each person has an equal chance of winning

(d) Long-run profits must be zero.

(xiii) What is the expected duration of the path BCDEGH ?

Activity	Predecessors	Optimistic	Most Likely	Pessimistic
A		2	3	4
B		2	4	6
C	A, B	3	4	8
D	C	2	3	7
E	D	4	6	8
F	E	5	8	13
G	E	4	4	4
H	F, G	2	4	6

(a) 17 (b) 26 (c) 25 (d) 37.33 (e) 39

Use the following information to answer the next 2 questions. (Q. No. XIV & XV)

Task	P Predecessors	Normal Time (weeks)	Minimum Time (weeks)	C Crash cost (per week)
A	None	8	7	$1000
B	A	3	2	$500
C	A	5	4	$1200
D	B, C	6	5	$1500
E	D	3	2	$800
F	D	5	4	$900
G	E, F	6	5	$3000

(xiv) What is the minimum possible project duration attainable ?

(a) 21   (b) 25

(c) 26   (d) 29

(e) None of the above answers is correct.

(xv) If you want to shorten the project by two weeks, which tasks should be crashed (and by how much) while minimizing direct costs ?
   (a) Task A by two weeks
   (b) Task B by two weeks
   (c) Task B by one week and Task E by one week
   (d) Task A by one week and Task F by one week
   (e) Task F by two weeks

(xvi) Which of the following relationships is not true

   (a) $W_s = W_q + \dfrac{1}{\mu}$ (b) $L_s = \lambda W_s$

   (c) $L_s = L_q + \dfrac{1}{\lambda}$ (d) $L_q = \lambda W_q$.

(xvii) The occurrence of degeneracy while solving a transportation problem means that
   (a) Total supply equals total demand
   (b) The few allocations become negative
   (c) Number of rows is not equal to number of columns
   (d) The solution so obtained is not feasible

(xviii) Which of the following method is not used for solving assignment problem ?
   (a) Hungarian method
   (b) Transportation method
   (c) Simplex method
   (d) None of the above.

(xix) Which of the following is used to calculate feasible solution in transportation problem :
   (a) Vogel's approximation method
   (b) Stepping stone method
   (c) North West Corner Rule
   (d) Both (a) and (c).

(xx) The expected value of project information is
   (a) The utility of additional information
   (b) Maximum expected opportunity loss
   (c) Equal to expected regret of the optimal decision under risk
   (d) None of the above.

SECTION - II

Attempt any **two** parts of the following :

2 (a) A company has three plants at locations **15** A, B, C which supply to warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in Rs.) are given below. Determine an optimum distribution for the company in order to maximize the total transportation cost.

(b) A project schedule has the following **15** characteristics :

Activity	1–2	1–3	2–4	3–4	3–5	4–9	5–6	5–7	6–8	7–8	8–10	9–10
Time (Days)	4	1	1	1	6	5	4	8	1	2	5	7

Calculate :
(i) Construct a network diagram
(ii) Find the critical path and total project duration
(iii) Calculate free float and independent float for each activity.

(c) Obtain the optimal strategies for both persons and **15** the value of the game for zero-sum two person games whose pay off matrix is as follows :

Player B

		B_1	B_2
	A_1	1	–3
	A_2	3	5
	A_3	–1	6
Player A	A_4	4	1
	A_5	2	2
	A_6	–5	0

SECTION - III

3 A television dealer finds that the cost of a TV in **12.5** stock for a week is Rs. 30 and the cost of a unit shortage is Rs. 70. For one particular model of TV the probability distribution of weekly sales is as follow :

Weekly	0	1	2	3	4	5	6
Probability	0.1	0.1	0.2	0.25	0.15	0.15	0.05

How many units per week should the dealer order ?

OR

3 Write detailed note on any **one** of the following **12.5**
(a) Explain in detail the different types of decision making environment.
(b) Explain the steps involved in information of decision tree.

4 Solve the following LPP **12.5**

Maximize $Z = 4x_1 + 6x_2 + 2x_3$

Subject to

$$x_1 + x_2 + x_3 \leq 3$$
$$x_1 + 4x_2 + 7x_3 \leq 9$$
$$x_1, \ x_2, \ x_3 \leq 0$$

OR

4 Discuss in brief 'duality' in linear programming. **12.5** Explain how the concept of duality can be useful in managerial decision-making.

5 Explain the following terms : **12.5**
(a) Principle of dominance
(b) Saddle point
(c) Pure strategy in game theory
(d) Two-person zero-sum game.

OR