INDIAN INSTITUTE OF MATERIALS MANAGEMENT

Post Graduate Diploma in Materials Management

PAPER – 18 C

OPERATIONS RESEARCH.

DATE: 15.06.2013   Max. Marks: 100

TIME: 2.00 p.m to 5.00 p.m.   Duration: 03 Hrs.

Instructions:

1. **The question paper is in two parts.**
2. **Part A is compulsory. Each question carries one mark**   **Total 25 marks**
3. **In part B answers 5 questions out of 6. Each question carries 15 marks.**   **Total 75 marks**

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PART – A   (attempt all questions)   (1x25 = 25 marks)

1. **Select the correct option:**

   a. If the C_j-Z_j row of the optimum simplex table contains a "zero" in the column of a non-basic variable, it is a case of

      i. Multiple optimal solutions.

      ii. Infeasible solution.

      iii. Unbounded solution.

      iv. None of the above.

   b. The Extreme Point Theorem is used for solving an LPP using:

      i. Graphical Method

      ii. Trial and Error Method

      iii. Algebraic Method

      iv. Simplex Method

   c. _____ can be said to be a special case of Transportation Model:

      i. LP model

      ii. Assignment model

      iii. Queuing model

      iv. None of the above

   d. Which of the following is a method of finding the optimum solution of a transportation model problem?

      i. North west corner rule

      ii. Stepping stone method

      iii. Both of the above

      iv. None of the above

e. Artificial variables represent:
    i. Unused resource
    ii. Over-used resource
    iii. Redundant resource
    iv. They have no practical significance

2. Match the following:

Column "A"		Column "B"	
a.	Time-cost tradeoff	i.	Arrival pattern in a queue
b.	Poisson distribution	ii.	Assignment model
c.	Post optimality analysis	iii.	Project crashing
d.	Hungarian method	iv.	Game theory
e.	Payoff matrix	v.	LPP

3. Fill in the blanks:
    a. _____ method of finding the initial solution to a transportation problem is the simplest. (north-west corner rule)
    b. The Big 'M' method is a variant of the simplex method that uses _____. (artificial variables)
    c. _____ algorithm is used for solving Sequencing problems. (Johnson's)
    d. In an unbalanced transportation problem we have to add a _____ row or a _____ column. (dummy, dummy)
    e. The dual of the dual is the _____ itself. (primal)

4. State true or false:
    a. OR is a tool employed to make managerial decisions more subjective.
    b. An assignment model problem is inherently degenerate.
    c. Sensitivity analysis is another name for post-optimality analysis.
    d. CPM is a probabilistic technique of network management.
    e. Forward pass and backward pass are techniques used in network crashing

    .

5. Give the full forms:
    a. IRR   b. NWCR   c. PERT   d. ARR   e. IPP

6. a. Write a note on Vogel's approximation method for finding the initial solution to a transportation model problem.

    b. Two products, namely P1 and P2 are being manufactured. Each product has to be processed through two machines M1 and M2. One unit of product P1 consumes 4 hours of time on M1 and 2 hours of time on M2. Similarly, one unit of P2 consumes 2 hours of time on M1 and 4 hours of time on M2. 60 hours of time is available on M1 and 48 hours on M2. The per unit contribution margin of P1 is 8 and of P2 is 6. Determine the number of units of P1 and P2 to be manufactured so as to maximise total contribution. Use simplex method.

7. a. Describe the steps involved in the Hungarian method for solving an assignment model problem.

    b. Formulate the dual of the following LPP:

    $$Minimise\ z = 20x_1\ +\ 40x_2$$

    $$subject\ to\ the\ constraints$$

    $$36x_1\ +\ 6x_2\ \geq\ 108$$

    $$3x_1\ +\ 12x_2\ \geq\ 36$$

    $$20x_1\ +\ 10x_2\ \geq\ 108$$

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

8. a. Describe the Monte Carlo Simulation technique.

    b. Find the optimum assignment:

		Job			
		A	B	C	D
Worker	1	120	100	80	90
	2	80	90	110	70
	3	110	140	120	100
	4	90	90	80	90

9. a. What is game theory? What are its basic assumptions?

    b. Find the value of the following game:

		Firm B			
		B1	B2	B3	B4
Firm A	A1	35	35	25	5
	A2	30	20	15	0
	A3	40	50	0	10
	A4	55	60	10	15

10. a. Discuss the components of a waiting line model.

   b. A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately a Poisson with an average rate of 10 in an 8 hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

11. a. Explain the meaning and benefit of 'crashing' in project management.

   b. Draw the network for the following project. Find the critical path. Compute project duration:

Activity	Predecessor	Duration (Weeks)
A	-	6
B	-	3
C	A	5
D	A	4
E	A	3
F	C	3
G	D	5
H	B, D, E	5
I	H	2
J	I, G, F	3

12. a. "Markov analysis is a method of analyzing the present behavior of a certain variable in an attempt to predict the behavior of the same variable in the future." Discuss.

   b. Optimise the transportation cost:

		Demand Points				Availability
		D1	D2	D3	D4	
Supply Points	P1	19	30	50	12	7
	P2	70	30	40	60	10
	P3	40	10	60	20	18
Requirement		5	8	7	15	

13. a. What is Goal Programming? When is it applicable?

 b. Find the optimum sequence and minimum elapsed time using Johnson's algorithm for the following 2-machine, 6-job problem:

	A	B	C	D	E	F
M1	4	8	3	6	7	5
M2	6	3	7	2	8	4

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