Roll No. Total No. of Pages : 04

Total No. of Questions : 15

MBA (2014 to 2017) (Sem.–3)

APPLIED OPERATIONS RESEARCH

Subject Code : MBA-301

Paper ID : [C1169]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A contains SIX questions carrying FIVE marks each and students has to attempt any FOUR questions.
2. SECTION-B consists of FOUR Subsections : Units-I, II, III & IV. Each Subsection contains TWO questions each carrying EIGHT marks each and student has to attempt any ONE question from each Subsection.
3. SECTION-C is COMPULSORY and consist of ONE Case Study carrying EIGHT marks.

SECTION–A

1. What is project management?
2. What are applications of operations research?
3. What is resource leveling?
4. What is linear programming?
5. What is pure strategy?
6. What is queuing theory?

SECTION–B

UNIT-I

7. Discuss uncertainty and risk situations in details.
8. Explain PERT with the help of a suitable example.

UNIT-II

9. A firm plans to purchase at least 200 quintals of scrap containing high quality metal X and low quality metal Y. It decides that the scrap to be purchased must contain at least 100 quintals of metal X and not more than 35 quintals of metal Y. The firm can purchase the scrap from two suppliers (A and B) in unlimited quantities. The percentage of X and Y metals in terms of weight in the scrap supplied by A and B is given below :

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

The price of A's scrap is Rs. 200 per quintal and that of B is Rs. 400 per quintal. The firm wants to determine the quantities that it should buy from the two suppliers so that the total cost is minimized. Use graphical method to solve this problem.

10. An advertising agency wishes to reach two types of audiences: Customers with annual income greater than Rs. 15,000 (target audience A) and customers with annual income less than Rs. 15,000 (target audience B).The total advertising budget is Rs. 2,00,000. One programme of TV advertising costs Rs. 50,000; one programme on radio advertising costs Rs. 20,000. For contract reasons, at least THREE programmes ought to be on TV, and the number of radio programmes must be limited to FIVE. Survey indicates that a single TV programme reaches 4,50,000 customers in target audience A and 50.000 in target audience B. One radio programme reaches 20,000 in target audience A and 80,000 in target audience B. Solve this problem using Simplex Method.

UNIT-III

11. Solve the following game :

Player A	**Player B**			
	Bl	**B2**	**B3**	**B4**
A1	3	2	4	0
A2	3	4	2	4
A3	4	2	4	0
A4	0	4	0	8

12. A book binder has one printing press, one binding machine and manuscripts of 7 different books. The time required for performing printing and binding operations for different books are shown below :

Book	1	2	3	4	5	6	7
Printing time (hours)	20	0	80	20	120	15	65
Binding time (hours)	25	60	75	30	90	35	50

Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all books.

UNIT-IV

13. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they come in. and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8-hours day. What is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

14. A firm is considering the replacement of a machine, whose cost price is Rs. 12,200 and its scrap value is Rs. 200. From experience the running maintenance and operating costs are found to be followings :

Year	1	2	3	4	5	6	7	8
Running Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

SECTION–C

(Compulsory)

15. **Nationwide Air Lines (Case Study)**

Nationwide Airlines, faced with a sharply escalating cost of jet fuel, is interested in optimizing its purchase of jet fuel at its various locations around the country. Typically, there is some choice concerning the amount of fuel that can be placed on board any flight segment, as long as minimum and maximum limits are not violated. The flight schedule is considered as a chain of flight segments, or legs, that each aircraft follows. The scheduling ultimately returns the aircraft to its starting point, resulting in a rotation. Consider the following rotations Delhi–Hyderabad–Cochin–Chennai–Delhi.

Table : Fuel requirements and Limits (1000 gallons unless specified otherwise)

City/Flight sequence	Minimum fuel required	Max. fuel allowed	Regular fuel consumption if minimum fuel boarded	Additional fuel burned per gallon of tankered fuel (i.e fuel above minimum- in gallons)	Price per Gallon (Rs.)
1. Delhi to Hyderabad	23	33	12.1	0.04	8,200
2. Hyderabad to Cochin	8	19	2.0	0.005	7,500
3. Cochin to Chennai	19	33	9.5	0.025	7,700
4. Chennai to Delhi	25	33	13.0	0.045	8,900

The fuel for any one of these flight segments may be bought at departure city, or it may be purchased at a previous city in the sequence and tankered for the flight. Of course, it takes fuel to carry fuel, and thus an economic trade-off between purchasing fuel at the lowest-cost location and tankering it all around the country must be made.

In the table above the column "regular fuel consumption" taken into account fuel consumption if the minimum amount of fuel is on board, and the column "additional fuel burned" indicates the additional fuel burned in each flight segment per gallon of "tankered" fuel carried; tankered fuel refers to fuel above minimum amount.

The fuel originally carried into Delhi should equal fuel carried into Delhi on the next rotation, in order for the system to be in equilibrium.

If L_i = Leftover fuel inventory coming into city i (1,000 gallons) and X_i = Amount of fuel purchased at city *i* (1.000 gallons) then, (L_i +X_i) is the amount of fuel on board the aircraft when it departs city *i*.

Q. Develop an LP model to solve this problem.