M.Com. 1st Semester Examination, 2011

OPERATIONS RESEARCH

PAPER – COM-103

Full Marks : 50

Time : 2 hours

Answer **all** questions

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

UNIT – I

[*Marks* : 20]

1. Answer any *two* of the following questions : 5 x 2

   (*a*) What is an Artificial Variable ? What strategy would you follow to drive it out of the simplex method of solving a LPP ?

(*b*) Explain with an example of various steps in having an Initial Feasible Solution to a Transportation problem, using Vogel's Approximation Method.

(*c*) What is a Travelling Salesman Problem ? Why is it so called ? What are the basic assumptions in solving such type of problem ?

(*d*) Write the dual of the following linear programming problem :

Maximise $Z = 3x_1 + 4x_2 + 7x_3$

subject to $x_1 + x_2 + x_3 \leq 10$

$4x_1 - x_2 - x_3 \geq 15$

$x_1 + x_2 + x_3 = 7$

where $x_1, x_2 \geq 0, x_3$ is unrestricted.

2. Answer any *one* of the following questions : 10 x 1

(*a*) Sources S_1 to S_5 are supplying materials to destinations D_1 to D_5 at the transportation costs

noted below. To meet the demands of D_1, D_2 and D_3, the sources S_4 and S_5 only are used while the sources S_1 to S_3 are available to meet the demands of destinations D_4 and D_5.

Destinations → Sources ↓	D_1	D_2	D_3	D_4	D_5	Capacity
S_1	–	5	7	8	6	60
S_2	3	–	5	15	5	70
S_3	8	5	–	12	13	130
S_4	9	3	10	–	7	70
S_5	3	2	8	7	–	40
Requirements	20	30	60	150	110	370

Find the delivery schedule at a minimum cost.

(*b*) A firm manufacturing office furniture provides you with the following information regarding resource consumption and availability and also profit contribution :

Resources	Usage per unit			Daily availability
	Tables	Chairs	BookCases	
Timber (Cft)	8	4	3	640
Assembly Department (Man-hours)	4	6	2	540
Finishing Department (Man-hours)	1	1	1	100
Profit contribution per unit (Rs.)	30	20	12	–
Minimum production requirement	0	50	0	–

Solve the problem using simplex method and find the optimal product-mix and the total maximum profit contribution.

UNIT – II

[*Marks* : 20]

3. Answer any *two* of the following questions : 5 x 2

(*a*) In a railway marshalling yard, goods trains arrive at a rate of 36 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service distribution is also exponential with an average of 30 minutes, calculate :

(*i*) Average waiting time in queue,

(*ii*) Probability of idleness of the service counter,

(*iii*) Average number of trains in the system,

(*iv*) Average number of trains in the queue.

(*b*) Choose the correct answer from the following alternatives in the statement and substantiate your answer with arguments :

'At EOQ-level, the ordering cost and carrying cost are : (*i*) equal, (*ii*) ordering cost is more than the carrying cost, (*iii*) carrying cost is more than ordering cost , (*iv*) not related in any way.'

(*c*) What is crashing in network analysis ? What principles are to be followed in crashing ? Is the same principle works in relaxation ?

(*d*) What is a Float in network analysis ? What are the different types of Floats ? How could you compute them.

4. Answer any *one* of the following questions : 10 x 1

(*a*) (*i*) What do you mean by Carrying cost in relation to inventory control ? What are its common components ?

(*ii*) A company needs 80,000 units of a particular component every year. The unit price for the component is Rs. 50. The ordering cost is estimated at Rs. 200 per order and the annual holding cost is estimated to be 10 % of the value of average inventory.

(*x*) What should be the optimal size of an order ?

(*y*) Calculate the optimum total inventory cost.

(*z*) If the price of the component is raised by Rs. 10 per unit, what will be the impact of such price hike on order size ? 3 + (5 + 1 + 1)

(*b*) From the following available data find the missing figures and determine optimum project schedule and optimum total cost considering indirect cost of Rs. 50 per day : 10

Activity	Precedence Relationship	Normal Time (days)	Normal Cost (Rs.)	Crash Time (days)	Crash Cost (Rs.)	Slope Rs./day
A	–	3	50	2	100	?
B	–	6	140	?	260	60
C	–	2	25	1	50	25
D	*A*	?	100	3	180	40
E	*C*	2	80	2	80	–
F	*A*	7	?	5	175	30
G	*B, D, E*	4	100	2	?	70

[*Internal Assessment* – 10 Marks]