Registration no. | | | | | | | | | | |

Total Number of Pages: 04 **MCA**

4th Semester Regular/Back Examination – 2015/16
Quantitative Techniques-I (Operations Research)
MCC405
BRANCH : MCA
Time: 3 Hours
Max marks: 70
Q CODE: W 419

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) What is infeasible solution? How can we detect infeasible solution while solving the problem using Graphical method?
b) What is degeneracy in LPP? How can it be resolved?
c) What is the principle of complementary slackness?
d) What is unbalanced transportation problem? How can it be converted to balanced one?
e) Define pure birth process.
f) What are different costs associated with inventory?
g) Define Total float and independent float,
h) Define little's formula.
i) What is EMV?
j) What is EOL?

Q2 a) An agriculturist has a farm with 126 acres of land. He produces Radish, Muttar and Potato. Whatever he raises is fully sold in the market. He gets Rs. 5 for Radish per kg., Rs. 4 for Muttar per kg. and Rs. 5 for Potato per kg. The average yield is 1,500 kg. of Radish per acre, 1,800 kg. of Muttar per acre and 1,200 kg. of Potato per acre. To produce each 100 kg. of Radish and Muttar and to produce each 80 kg. of Potato, a sum of Rs. 12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man-days for Radish and Potato each and 5 man-days for Muttar. A total of 500 man-days of labour at the rate of Rs. 40 per man-day are available. Formulate this as a linear programming model to maximize the agriculturist's total profit. (5)

b) Solve the following linear programming problem by using Simplex method: (5)

Maximize

$$Z = x_1 + x_2$$

Subject to the constraints:

$$x_1 - 2x_2 \leq 2$$
$$-x_1 + 2x_2 \leq 2$$

$x_1, x_2 \geq 0$

Q3 a) Solve the following linear programming problem by using Big-M method: (5)

Minimize

$$Z = 60x_1 + 80x_2$$

Subject to the constraints:

$$20x_1 + 30x_2 \geq 900$$
$$40x_1 + 30x_2 \geq 1200$$
$$x_1, x_2 \geq 0$$

b) Suggest optimum assignment of 4 workers A, B, C and D to 4 jobs I, II, III and IV. The time taken by different workers in completing the different jobs is given below: (5)

Workers	*Jobs*			
	I	*II*	*III*	*IV*
A	*8*	*10*	*12*	*16*
B	*11*	*11*	*15*	*8*
C	*9*	*6*	*5*	*14*
D	*15*	*14*	*9*	*7*

Also indicate the total time taken in completing the jobs

Q4 Find the optimal solution of the following Transportation Problem to minimize the total cost of transportation whose cost matrix is given below: (10)

Supply Points	*Destinations*				*Supply*
	D_1	D_2	D_3	D_4	
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
Demand	5	8	7	15	

Q5 At a service counter of Green Chilly Fast Food shop, the customers arrive at the average interval of six minutes whereas the counter takes on an average 5 minutes for preparation of bill and delivery of the item. Calculate the following: (10)

i) Counter utilization level.
ii) Average number of customers in the service counter area.
iii) Average number of customers in the line.
iv) Probability that the counter clerk is idle.
v) Probability of finding the clerk busy.
vi) Average waiting time of the customers at the fast food shop
i) Expected average waiting time in the line.

Q6 Write short notes on: (*Any Two*) (5× 2)

a) Deterministic Multiechelon inventory model.
b) Decision Tree.
c) Crashing.

Q7 a) The annual demand of a product is 24,000 units. The buying cost per order is Rs. 100 and the estimated cost of carrying one unit in stock for a month is 2%. The normal price for the product is Rs. 10 per unit. However, the supplier offers a discount of 7.5% for an order of at least 3,000 units and a (5) discount of 12.5% if an order is for at least 5,000 units. Find the most economic purchase quantity per order and the optimal total cost.

b) A small maintenance project consists of 12 activities which take place according to the following conditions: (5)

Activity	***Preceding Activity***
B, C, D	A
E, F	B
G	E
H	F
I	G, H
J	G, H, C, D
K	D
L	I, J, K

The time taken to complete each activity (in hours) is as follows:

Activity:	A	B	C	D	E	F	G	H	I	J	K	L
Time (in Hours):	3	4	5	6	2	1	7	4	3	5	6	2

i) Draw a project network and indicate the critical path.
ii) Find the expected duration of the project.
iii) Without violating project completion duration activity I can be delayed by how many hours?

Q8 Consider a project having the following activities and their time estimates: (10)

Activity	***Immediate Predecessor***	***Expected Time (in days)***		
		Optimistic Time	***Most likely Time***	***Pessimistic Time***
A	—	3	4	5
B	—	4	8	10
C	B	5	6	8
D	A, C	9	10	15
E	B	4	6	8
F	D, E	3	4	5
G	D, E	5	6	8
H	D, E	1	3	4
I	G	2	4	5
J	F, I	7	8	10
K	G	4	5	6
L	H	8	9	13
M	J, K L	6	7	8

i) Draw the arrow diagram for the project.
ii) Compute the expected project completion time.
iii) What should be the due date to have 0.80 probability of completion?
iv) What is the probability of completing the project 2 days earlier than expected?
v) Find the total float for all non-critical activities.