PGCO-8(PT/9/VIII)

POST-GRADUATE COURSE

Term End Examination : December, 2014 / June, 2015 COMMERCE

Paper-VIII : Quantitative Techniques

Time : 2 Hours Full Marks : 50

(Weightage of Marks : 80%)

Special credit will be given for accuracy and relevance in the answer. Marks will be deducted for incorrect spelling, untidy work and illegible handwriting. The weightage for each question has been indicated in the margin.

Group – A

Answer any *two* questions : $15 \times 2 = 30$

 a) A company makes two kinds of leather belts A and B. The respective profits are Rs. 40 and Rs. 25 per belt. Each belt of type-A requires twice as much time as a belt of type-B and if all belts were of type-B, the company could make 1000 per day. The supply of leather is sufficient for only
 PG-COM-1165-P [P. T. O. 1200 belts per day (both *A* and *B*). Belt-*A* requires a fancy buckle and only 500 per day are available. There are only 900 buckles per day available of belt-*B*. Formulate a linear programming problem.

- b) Solve graphically the following L.P.P. : Maximize : $Z = 4x_1 + 3x_2$ subject to $x_1 + x_2 \le 50$ $x_1 + 2x_2 \le 80$ $2x_1 + x_2 \ge 20$ and $x_1, x_2 \ge 0$
- c) Define basic feasible solution. 6 + 6 + 3
- 2. Solve the following L.P.P. by the simplex method :

Minimize :	$Z = 2x_1 + 9x_2 + x_3$	
subject to	$x_1 + 4x_2 + 2x_3 \ge 5$	
	$3x_1 + x_2 + 2x_3 \ge 4$	
and	$x_1, x_2, x_3 \ge 0$	15

PG-COM-1165-P

3 **PGCO-8(PT/9/VIII)**

3. a) Obtain the dual of the following L. P. P. :

Maximize $Z = 6x_1 + 5x_2 + 10x_3$ subject to $4x_1 + 5x_2 + 7x_3 \le 5$ $3x_1 + 7x_3 \le 10$ $2x_1 + x_2 + 8x_3 = 20$ $2x_2 + 9x_3 \ge 5$

and $x_1, x_3 \ge 0$; x_2 unrestricted in sign. 15

 b) Obtain optimum basic feasible solution to the following transportation problem with cost matrix as follows :

	D	Destinations				Availability
		D ₁	D_2	D_3	D_4	_
	s_1	19	30	50	10	7
Sources	s_2	70	30	40	60	9
	s_3	40	08	70	20	18
Requirement		5	8	7	14	

5 + 10

PG-COM-1165-P

[P. T. O.

PGCO-8(PT/9/VIII) 4

- 4. a) Show that assignment problem is a special case of L. P. P.
 - b) An airline that operates between Kolkata and Delhi has the time table shown below.
 Crews must have a minimum layover of 5 hours between two flights. Obtain the pairing of flights that minimizes total layover time.

Kolkata - Delhi			Delhi-Kolkata			
Flight No.	Departure	Arrival	Flight No.	Departure	Arrival	
101	6.00 am	8.00 am	201	7.30 am	9.45 am	
102	7.30 am	9.30 am	202	9.00 am	11.15 am	
103	10.30 am	12.30 pm	203	11.30 am	1.45 pm	
104	6.00 pm	8.00 pm	204	7.30 pm	9.15 pm	

3 + 12

Group - B

Answer any two questions.

 $10 \times 2 = 20$

5. Two food manufactures *A* and *B* are competing for an increased market share. The pay-off matrix shows the increase in market share of *A* and decrease of *B*. Determine optimal strategies for both the manufactures and the value of the game.

$$A_1 = B_1 = \text{Give coupons}$$

 $A_2 = B_2 = \text{Decrease price}$

PG-COM-1165-P

PGCO-8(PT/9/VIII)

10

$A_3 = B_3$ = Maintain present strategy						
$A_4 = B_4$ = Increase advertising.						
	B ₁	B_2	B_3	B_4		
A_{l}	2	- 2	4	1		
A_2	6	1	12	3		
A_3	- 3	2	0	6		
A_4	2	- 3	7	1		

6. A project consists of 9 activities whose time estimates (in weeks) and other characteristics are given below :

Activity	Preceding activity	Optimistic	Most likely	Pessimistic
Α	—	2	4	6
В	_	6	6	6
С	—	6	12	24
D	А	2	5	8
E	А	11	14	23
F	B, D	8	10	12
G	B, D	3	6	9
Н	<i>C</i> , <i>F</i>	9	15	27
Ι	E	4	10	16

Time Estimate

a) Draw the network of the project.

PG-COM-1165-P

PGCO-8(PT/9/VIII) 2

b) What is the project completion time and its

variance ?

c) What is the probability of completing the

project one week before the expected time ?

[Given
$$\Phi$$
 (0.30) = 0.6179] 4 + 3 + 3

7. A company producing 3 items has a limited inventories of averagely 500 items of all types.
Determine the optimal production for each item separately, if the following information is given : 10

Product :	1	2	3
Holding cost (Re.)	0.05	0.03	0.04
Set-up cost (Rs.)	45	40	50
Demand :	110	125	80

PG-COM-1165-P

3 **PGCO-8(PT/9/VIII) PGCO-8(PT/9/VIII)** 4

8. Write short notes on any *two* of the following:

 $5 \times 2 = 10$

- a) Degenerate transportation problem.
- b) Mixed-strategy game.
- c) Crashing of a project.
- d) Dual simplex algorithm in L.P.P.

-