UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. .....

Roll No. in Words. .....

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Signature of Supdt.:

PAPER: Operations Research-I **MAX. TIME: 30 Min.**

Course Code: MATH-412 Part–I (Compulsory) **MAX. MARKS: 10**

Attempt this Paper on this Question Sheet only.
Please encircle the correct option. Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

Q1. MCQs (Marks=10)	
(i)	Surplus variable is associated to _____ type constraint a) ≤ b) ≥ c) = d) none
(ii)	For LP model with n variables and m constraints, the maximum number of corner points is a) n-m b) nm c) C_m^n d) none
(iii)	In LP problem, the leaving variable corresponds to the basic variable with _____ ratio. (a)minimum non-negative (b) minimum non-positive (c) maximum non-negative (d) maximum non-positive
(iv)	The non-negative variable in dual corresponds to ____ type constraint (a) ≤ (b) ≥ (c) = (d) zero
(v)	The rule associated with selection of entering variable is referred as _____ (a) optimality condition (b)Gauss Jordan row operation (c) feasibility condition (d) None
(vi)	For minimization LP problem, the coefficient of artificial variable in M-technique is_____ (a) +1 (b) -1 (c) +M (d) -M
(vii)	The most suitable algorithm for solving assignment model is (a) North-West Corner Method (b) Simplex Method (c) Hungarian Method (d) Revised Simplex Method
(viii)	The number of basic variables in an $m \times n$ transportation table is a) m+n b) m- n c) m+n-1 d) m+n+1
(ix)	The method used to determine the shortest route problem between two nodes (a) Dijkstra's algorithm (b) Floyd's algorithm (c) both (a) & (b) (d) None
(x)	LP model with _____ constraints have no solution a) type = b) inconsistent c) type ≥ d) type ≤

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Roll No. .....

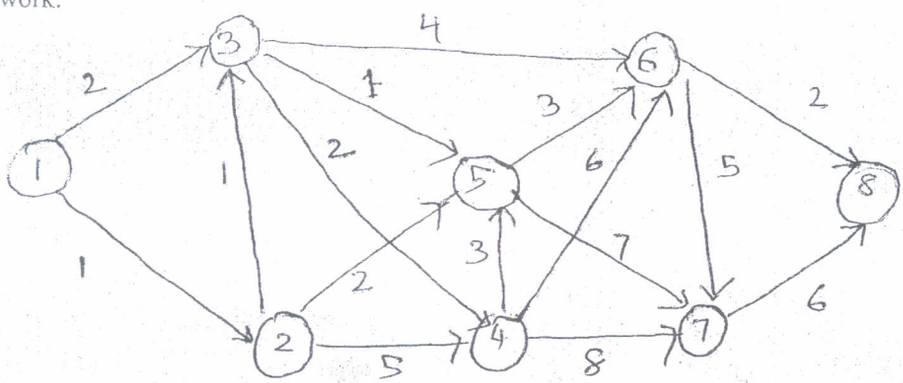
PAPER: Operations Research-I
Course Code: MATH-412 Part – II

MAX. TIME: 2 Hrs. 30 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Answer these short questions. **(5x4=20)**

	Short Questions
(i)	Write the algorithm of two phase method.
(ii)	Solve the following LP problem by simplex method. Minimize $z = 8x_1 - 2x_2$ subject to $-4x_1 + 2x_2 \leq 1$ $5x_1 - 4x_2 \leq 3$ $x_1, x_2 \geq 0$
(iii)	Write a note on Assignment model and illustrate the method to solve this model.
(iv)	Use Dijkstra's algorithm to find the shortest route between node 1 and every other node in the network.



P.T.O.

Q.3 **Long Questions (10× 3 = 20 Marks)**

(i) Write the dual of the following primal LP model and determine the values of dual variables and primal variables.

$$\text{Maximize } z = 4x_1 + 2x_2$$

subject to

$$x_1 - 2x_2 \geq 2$$

$$x_1 + 2x_2 = 8$$

$$x_1 - x_2 \leq 10$$

$x_1 \geq 0$ and x_2 unrestricted in sign.

(ii) A firm has two bottling plants, one located at Coimbatore and other at Chennai. Each plant produces three drinks, Coca-cola, Fanta and Thumps-up, named A, B, and C, respectively. The number of bottles produced per day are as follows:

	Plant at	
	Combatore(E)	Chennai(F)
Cocacola(A)	15,000	15,000
Fanta(B)	30,000	10,000
Thumps-up(C)	20,000	50,000

A market survey indicates that during the month of April, there will be a demand of 200,000 bottles of Coca-cola, 400,000 bottles of Fanta and 440,00 bottles of Thumps-up. The operating cost per day for plants at Combatore and Chennai is 600 and 400 monetary units respectively. For how many days each plant be run in April so as to minimize the production cost while still meeting the market demand?

(iii) A military equipment is to be transported from origins 1, 2, 3 to destinations 1, 2, 3, 4. The supply at the origins, the demand at the destinations and time of shipment is given below. Work out a transportation plan so that the time required for the shipment is the minimum.

	Destination				Supply
Origin	10	22	0	22	8
	15	20	12	8	13
	20	12	10	15	11
Demand	5	11	8	8	