The Co-operative University of Kenya

END OF SEMESTER EXAMINATIONS

EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

COURSE CODE: BSTA 2207

UNIT TITLE: OPERATION RESEARCH

DATE: DECEMBER, 2019 Time: 2 Hours

INSTRUCTIONS

1. Answer question **ONE** and any other **TWO (2)** questions
2. Scientific Calculators and non-programmable calculators may be used

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1. (a) Define the following terms:
   - i. Operation research (**1** *marks*)
   - ii. Linear Programming (**1** *marks*)
   - iii. Transportation Problem (**1** *marks*)

   (b) A company has 3 operational departments weaving, processing and packing with the capacity to produce 3 different types of clothes that are suiting, shirting and woolen yielding with the profit of Rs. 2, Rs. 4 and Rs. 3 per meters respectively. 1m suiting requires 3 mins in weaving 2 mins in processing and 1 min in packing. Similarly 1m of shirting requires 4 mins in weaving 1 min in processing and 3 mins in packing while 1m of woolen requires 3 mins in each department. In a week total run time of each department is 60, 40 and 80 hours for weaving, processing and packing department respectively. Formulate a LPP to find the product to maximize the profit. (**5** *marks*)

   (c)
   - i. State four merits of duality (**4** *marks*)
   - ii. Write the dual of the following problem (**4** *marks*)

   Min $Z_x = 2x_2 + 5x_3$
   Subject to
   $x_1 + x_2 \geq 2$
   $2x_1 + x_2 + 6x_3 \leq 6$
   $x_1 - x_2 + 3x_3 = 4$
   $x_1, x_2, x_3 \geq 0$

   (d) Solve by simplex method
   Maximize $Z = 80x_1 + 55x_2$
   Subject to
   $4x_1 + 55x_2 \leq 40$
   $2x_1 + 4x_2 \leq 32$
   and $x_1 \geq 0$,$x_2 \geq 0$ (**10** *marks*)

   (e) Solve the following play off matrix (**4** *marks*)

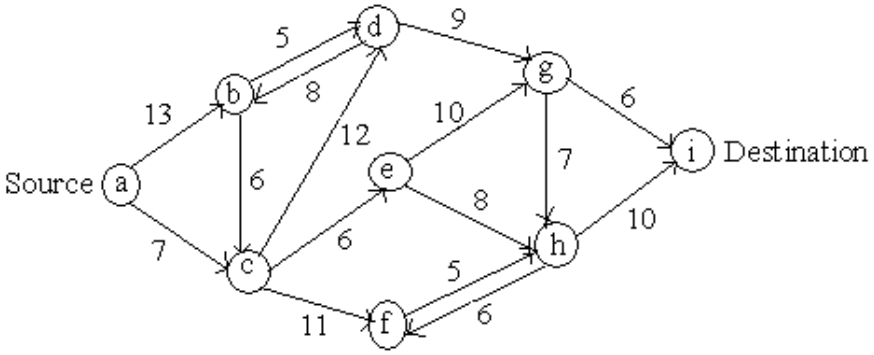
		Player B				
		I	II	III	IV	V
Player A	I	-2	0	0	5	3
	II	3	2	1	2	2
	III	-4	-3	0	-2	6
	IV	5	3	-4	2	-6

2. Solve the following LP problem using graphical method (**20** *marks*)
   Minimize $Z = 10x_1 + 4x_2$
   Subject to $3x_1 + 2x_2 \geq 60$
   $7x_1 + 2x_2 \geq 84$
   $3x_1 + 6x_2 \geq 72$
   $x_1 \geq 0$, $x_2 \geq 0$

3. A car hire company has one car at each of five depots a, b, c, d and e. a customer requires a car in each town namely A, B, C, D and E. Distance (kms) between depots (origins) and towns (destinations) are given in the following distance matrix, determine the minimum distance assignment. (**20** *marks*)

	a	b	c	d	e
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

4. Find the shortest path (**20** *marks*)



5. Use duality to solve the given problem

Min $Z = x_1 - x_2$
Subject to
$2x_1 + x_2 \geq 2$
$-x_1 - x_2 \geq 1$
and $x_1 \geq 0$,$x_2 \geq 0$ (**20** *marks*)