MBA & MBA (Finance) II Semester Regular & Supplementary Examinations June 2019
OPERATIONS RESEARCH
(For students admitted in 2017 & 2018 only)

Time: 3 hours   Max. Marks: 60

All questions carry equal marks
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SECTION – A
(Answer the following: 05 X 10 = 50 Marks)

1   A company produces two types of leather belts, A and B. Belt A is of a superior quality and B is of an inferior quality. The profit from the two are 40 and 30 paise per belt, respectively. Each belt of type A requires twice as much time as required by a belt of type B. if all the belts were of type B, the company could produce 1,000 belts per day. But the supply of leather is sufficient only for 800 belts per day. But the supply of leather is sufficient only for 800 belts per day. Belt A requires a fancy buckle and only 400 of them are available per day. For belt B only 700 buckles are available per day. Solve this problem to determine how many units of the two types of belts the company should manufacture in order to have the maximum overall profit?

OR

2   A manufacturing firm has discontinued the production of a certain unprofitable product line. This has created considerable excess production capacity. Management is considering to devote this excess capacity to one or more of three products; call them product 1, 2 and 3. The available capacity on the machines that might limit output is summarized in the following table:

Machine Type	Available Time (in Machine-hours per Week)
Milling Machine	250
Lathe	150
Grinder	50

The number of machine-hours required for each unit of the respective product is as follows:

Machine Type	Available Time (in Machine-hours per week)		
	Product 1	Product 2	Product 3
Milling Machine	8	2	3
Lathe	4	3	0
Grinder	2	--	1

The profit per unit would be Rs 20, Rs 6 and Rs 8, respectively for product 1, 2 and 3. Find how much of each product the firm should produce in order to maximize its profit.

3   A company receives parts from suppliers to be used in its manufacturing departments. The quality control department must perform two operations when shipments are received: operations A-draw a random sample, package, and deliver to testing, Operation B-test the material and issue a disposition report. The time estimates for processing six shipments through quality control are:

Shipment	Operation A(hours)	Operation B (hours)
1	1.3	0.9
2	1.3	1.1
3	0.8	1.5
4	1.6	1.4
5	1.5	1.0
6	1.2	1.9

Use Johnson's algorithm find the sequence and compute the make span and idle times (shipment) of the jobs using Gantt chart?

OR

4   The Morris Machine Company just received an order to refurbish five motors for material handling equipment that were damaged in a fire. The motors will be repaired at two workstations in the following manner.
Workstation1: Disseminate the motor and clean the parts
Workstaion2: Replace the parts as necessary, test the motors and make adjustments.
Plant manager is interested in developing a schedule that minimizes the makespan and has authorized around the clock operations until the motors have been repaired. The estimated time to repair each motor is shown in the following table.

Motor	Workstation 1	Workstation 2
M1	12	22
M2	4	5
M3	5	3
M4	15	16
M5	10	8

5   John Galt Shipping wishes to ship a product that is made at two different factories to three different warehouses. They produce 18 units at Factory A and 22 units at Factory B. They need 10 units in warehouse #1, 20 units in warehouse #2, and 10 units in warehouse #3. Per unit transportation costs are shown in the table below. How many units should be shipped from each factory to each warehouse?

	Warehouse #1	Warehouse #2	Warehouse #3
Plant A	$4	$2	$3
Plant B	$3	$2	$1

OR

6   Five workers are available to work with the machines and the respective costs (in Rs.) associated with each worker-machine are given below. A sixth machine is available to replace one of the existing ones and the associated costs of that machine also given.

Workers/Machines	M1	M2	M3	M4	M5	M6
W1	12	3	6	----	5	9
W2	4	11	----	5	----	8
W3	8	2	10	9	7	5
W4	----	7	8	6	12	10
W5	5	8	9	4	6	1

(i) Determine whether new machine can be accepted or not.
(ii) Also determine optimal assignment and associated saving in cost.

7   What is the saddle point of the game? Explain the dominance principle and reduce the following game by dominance and hence find the game value.

Player B

		I	II	III	IV
Player A	I	3	2	2	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

OR

8   Two players A and B play a game in which each has three coins- a 1-rupee coin, a 2 rupee coin and a 5 rupee coin. Each player selects a coin without the knowledge of each other's choice. If the sum of the coin is an odd amount, A wins B's coin: if the sum is even, B wins A's coin. Find the best strategy for each player and value of the game.

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9   List the rules for drawing network diagrams and how AOA is different than AON.

OR

10   From the below data find what is the probability of completing project less than 23 days.

Activity	Immediate Predecessors	Optimistic Time (days)	Most likely Time (days)	Negative Time (days)
A	....	7	9	11
B	A	1	2	3
C	A	7	8	9
D	B	2	5	11
E	C	2	3	4
F	C	1	4	8
G	D, E	6	7	8
H	F, E	2	6	9

SECTION – B
(Compulsory question, 01 X 10 = 10 Marks)

11   **Case Study:**

A company is planning its production schedule over the next six months (it is currently the end of month 2). The demand (in units) for its product over that timescale is as shown below:

Month	3	4	5	6	7	8
Demand	5000	6000	6500	7000	8000	9500

The company currently has in stock: 1000 units which were produced in month 2; 2000 units which were produced in month 1; 500 units which were produced in month 0. The company can only produce up to 6000 units per month and the managing director has stated that stocks must be built up to help meet demand in months 5, 6, 7 and 8. Each unit produced costs £15 and the cost of holding stock is estimated to be £0.75 per unit per month (based upon the stock held at the beginning of each month).

The company has a major problem with deterioration of stock in that the stock inspection which takes place at the end of each month regularly identifies ruined stock (costing the company £25 per unit). It is estimated that, on average, the stock inspection at the end of month t will show that 11% of the units in stock which were produced in month t are ruined; 47% of the units in stock which were produced in month t-1 are ruined; 100% of the units in stock which were produced in month t-2 are ruined. The stock inspection for month 2 is just about to take place.

The company wants a production plan for the next six months that avoids stock outs. Formulate their problem as a linear program.

Because of the stock deterioration problem the managing director is thinking of directing that customers should always be supplied with the oldest stock available. How would this affect your formulation of the problem?

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