First Semester   MBA(Business Analytics)Program

END SEMESTER EXAMINATION   *November-December 2019*

Paper Code MB 107   Paper Title: Introduction to Business Analytics

Time: 3 Hours   *Max Marks: 60*

- *Marks carried by each question are indicated after the question.*
- *Use of scientific calculator is allowed.*

Q1. a) Define Business Analytics. Discuss the importance of analytics in Business domain by giving suitable example for each.   (6 marks)
   b) Describe SMART test for ensuring metric relevance to business.   (6 marks)

Q2. a) The prices of tea company shares in Mumbai and Kolkata for last 6 months are recorded below. Determine in which market the share price show less variability.   (6 marks)

Month	Jan	Feb	March	April	May	June
Share Price($),Mumbai	105	120	115	118	130	127
Share Price($),Kolkata	108	117	120	130	100	125

   b) What is simulation? Describe the simulation process. What are the advantages and limitations of simulation?   (6 marks)

Q3. *Accu-Copiers, Inc.,* sells and services the Accu-500 copying machine. As part of its standard service contract, the company agrees to perform routine service on this copier. To obtain information about the time it takes to perform routine service, *Accu-Copiers* has collected the following data for 6 service calls:

No. of copiers serviced	4	2	5	7	1	-3
No. of minutes required	109	58	138	189	37	82

   a) Develop a scatter diagram of the above data and interpret it.   (2 marks)
   b) Determine the least square regression equation of minutes required on copiers serviced.   (4 marks)
   c) Interpret regression coefficients $b0$ and $b1$. Does the interpretation of $b0$ make practical sense?   (2 marks)
   d) Estimate the mean time to service four copiers.   (2 marks)
   e) Compute coefficient of determination and interpret it.   (2 marks)

Q4. Using only the information in the sensitivity report, answer the following questions:
   a) Determine the optimal solution and the optimal objective function value.   (2 marks)
   b) Explain the reduced cost associated with number of mugs (x).   (2marks)

c) Explain the shadow price associated with clay usage *(in lb)*. (2 marks)

d) Find the range of values of the objective function coefficient of *x* for which the current basis remains optimal. (2 marks)

e) Find the range of values of the R.H.S. of constraint 2 for which the current basis remains optimal. (2 marks)

f) How do the optimal decision variables and objective function value change if the R.H.S. of constraint 1 increases by 20? (2 marks)

$$\text{Maximize profit } Z = 40x + 50y$$
$$s.t. \quad x + 2y <= 40 \text{ hr of labor}$$
$$4x + 3y <= 120 \text{ lb of clay}$$

Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
$BS8	No. of Bowls(x)	24	0	40	26.67	15
C8	No. of Mugs(y)	8	0	50	30	20

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
D4	Labor(hr/unit)Usage	40	16	40	40	10
D5	Clay(lb/unit)Usage	120	6	120	40	60

Or

a) "Predictive and Prescriptive analytics are sometimes therefore referred to as advanced analytics". Discuss. (6marks)

b) The Rolling Creek Textile mill produces two products: denim and brushed-cotton cloth which he exports to other states. The sale price for each of the product is dependent upon the quantity to be produced. The sales-price relationships for these two products are as follows:

Products	Quantity produced	Unit Price
Denim	2000-5p	p
Brushed-Cotton	4000-10q	q

If *x* and *y* are the quantities produced for both the products respectively. The production costs for each of the products are $200x + 0.2x^2$ and $300y + 0.2y^2$. There is restriction on the production capacity of the denim and cotton cloths are 200 units and 400 units respectively. Similarly there is a restriction on man-power available. Total of 260 man-days are available. The production of one piece of denim requires 3 man-days and one piece of cotton cloth requires 2 man-days. The machinery hour for the producing both of the products is limited to 600 hours per day. Two hours are required to produce one unit of denim and one hour is required to produce one unit of cotton cloth. Formulate the above problem as Non-Linear optimization model. (6marks)

05. Polo Hospital imports implants for Knee Anthroplasty. Different knee surgeries require implants of different sizes. The hospital buys these from two different supplies- Knee-wala and Knee-sure. The supplies by both of them are in *packs of 100*. The cost and the size-mix of the implant purchased are given in the following table.

Supplier	Cost per pack ('000 Rs.)	No. of Implants		
		Large	Medium	Small
Knee-wala	8	40	20	40
Knee-sure	6	20	40	40

Each quarter the hospital requires atleast 120 large implants, 200 medium implants and 220 small implants. Because of limited availability, at most *400 implants (i.e. 4 packs)* can be purchased from each supplier.

a) Formulate and determine the optimal number of packs that should be purchased from each supplier so as to minimize the total cost.(Use Graphical method) (8marks)

b) Is the above problem Integer Programming Problem? (2marks)

c) In what conditions Integer and Binary linear models are used? (2marks)