The Assam Royal Global University, Guwahati
Royal School of Business
BBA Integrated, 5th Semester
Semester End Examination, January 2022
Course Title: Quantitative Techniques in Management
Course Code: BSA034C105

Time: 3 Hours

Maximum Marks: 70

The figures in the right-hand margin indicate marks.

Section – A

Q.1. Attempt *all questions*.

2x8

a. If the matrix A is given by $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$, then prove that   2

$A^2 - 4A + 3I = O$, where I is the unit matrix of order 2 and O is the null matrix of order 2.

b. Solve $\begin{vmatrix} 1 & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix} = 0$ 2

c. Find $\frac{dy}{dx}$ when $y = \frac{1+x}{1-x}$ 2

d. Write the criteria for a maximum and minimum at a point.   2

e. If A, B, C and D are four chemicals costing Rs. 15, Rs. 12, Rs.8 and Rs. 5

f. per cent 100g respectively and are contained in a given compound in the ratio of 1,2,3 and 4 parts respectively, then what should be the price of the resultant compound.   2

g. The normal rate of infection of a certain disease in animals is known to be 25 percent. In an experiment with 6 animals injected with a new vaccine it was observed that none of the animals caught the infection. Calculate the probability of the observed results.   2

h. Draw the scatter diagram of Positive linear relationship, Negative linear relationship, No relationship and non-linear relationship.   2

i. The coefficient of correlation between two variables x and y is 0.3. The covariance is 9. The variance of x is 16. Find the standard deviation of y series. 2

Section – B

Q.2. Attempt *any two* of the following

6 x 2

a. The following table shows the fixed cost (F) and the variable cost (V) in thousand rupees of producing 1 unit of commodity A and 1 unit of commodity B.

		Product	
		A	B
Cost	F	5	8
	V	4	12

When x units of A and y units of B are produced, the total fixed cost is Rs 6,40,000 and the total variable cost is Rs 8,20,000. Find the quantities of A and B produced using matrix method.   6

b. Solve the following system of equations by matrix inversion method   6
$$3x+2y+4z = 19; \; 2x-y+z=3; \; 6x +7y -z =17$$

c. A manufacturer produces three products A, B and C which he sells in two markets A and B, Annual sales volumes are indicated as follows: 6

Market	Products		
	A	B	C
P	10,000	2000	18000
Q	6,000	20,000	8000

(i). If unit sale prices of A, B and C are Rs. 2.50, Rs. 1.25 and Rs. 1.50 respectively, find the total sale revenue in each market with the help of matrix algebra.

(ii). If the unit costs of the above three commodities are Rs. 1.80, Rs. 1.20 and Rs.0.80 respectively, find the gross profit.

Q.3. Attempt **any two** of the following   **7 x 2**

a. A monopolist has a demand curve x= 106 -2P and average cost curve   7

$A= 5+ \frac{x}{50}$, where P is the price per output and x is the number of units of output.

If the total revenue is R=xP, Determine (i)Total cost (ii) the most profitable output (iii) the maximum profit.

b. (i) If $u = x^4 -5xy^2 + 6x^2 +2xz^2 -xyz$, Find all the second order   3.5

cross partial derivatives.

(ii) If $y = x^2 -2xy + y^2 = 8$, Find $\frac{dy}{dx}$ of the implicit function.   3.5

c. Find (i) the average revenue function (AR) and (ii) marginal revenue   7

function (MR) for the following total revenue function (TR). Evaluate them

at Q=2 And Q=7

$$TR= 27Q - \frac{Q^2}{3} +Q$$

Q.4. Attempt **any two** of the following   **7 x 2**

a. The breaking strength of 80 "test pieces" of a certain alloy is given in   7

The following table of the unit being given to the nearest thousand grams

per square inch:

Breaking Strength	Number of Pieces
44-46	3
46-48	24
48-50	27
50-52	21
52-54	5

(i) Calculate the average breaking strength of the alloy and the standard deviation.

(ii) Calculate the percentage of observations lying between $\bar{x} \pm 2\sigma$

b. The length of time taken by each of 18 workers to complete a specific job was observed to be the following: 7

Time (in min)   : 5-9   10-14   15-19 20-24 25-29

Number of workers :   3   8   4   2   1

  (i) Calculate Median time

  (ii) Calculate Q_1 and Q_3

  (iii) Calculate Mode

c. The following table gives the number of days in a 50- day period during which automobile accidents occurred in a city: 7

No. of Accidents : 0   1   2   3   4

No. of days   : 21   18   7   3   1

Fit a Poisson Distribution to the data

Q.5.   Attempt **any two** of the following   7 x 2

a. A survey of 800 families with 4 children each revealed following distribution: 7

No. of Boys	:	0	1	2	3	4
No. of Girls	:	4	3	2	1	0
No. of families	:	32	178	290	236	64

Is this result consistent with the hypothesis that male and female births are equally probable?

b. Ten competitors in a beauty contest are ranked by three judges in the following order: 7

Judge 1:	1	6	5	10	3	2	4	9	7	8
Judge 2:	3	5	8	4	7	10	2	1	6	9
Judge 3:	6	4	9	8	1	2	3	10	5	7

Use the rank correlation coefficient to determine which pair of judges has the nearest approach to common tastes in beauty

c.
Commodity	p_1	q_1	p_0	q_0	
A	5	14	3	8	7
B	8	18	6	25	
C	3	25	1	40	
D	15	36	12	48	
E	9	14	7	18	
F	7	13	5	19	

Calculate the index number by using Passche's method, Fisher's method and Marshall-Edgeworth Method.

****