CMA JUNE, 2020 EXAMINATION
FOUNDATION LEVEL
SUBJECT: 003. QUANTITATIVE TECHNIQUES

Time: Three hours | Full Marks: 100

- ❖ Answer any **TEN** questions, FIVE questions from each part.
- ❖ Answer must be brief, relevant, neat and clean.
- ❖ Use fresh sheet for answering each question.

PART –A: BUSINESS MATHEMATICS

Q. No. 1

(a) In a recent survey of 525 people in Mymenshing city, it is found that 350 read newspapers for news, 215 listened radios and 140 watched televisions, additionally 75 read the newspapers and watched televisions, 40 listened radios and watched televisions and 100 read the newspapers and listened radios. If 25 used all three sources of news, how many people utilized none of the three? Also show your result using Venn diagram.

(b) If $2^x = 4^y = 8^z \ and \ xyz = 288, \ then \ show \ that$

$$\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{11}{96.}$$

[Marks: (5+5) = 10]

Q. No. 2

(a) A manufacturer can sell a certain product for $110 per unit. Total cost consists of a fixed overhead of $7500 plus production costs of $60 per unit.

(i) How many units must the manufacturer sell to get 0(zero) profit?

(ii) What is the manufacturer's profit or loss if 100 units are sold?

(iii) How many units must be sold for the manufacturer to realize a profit of $1250?

(b) A man borrows Taka 2 lakhs at 9% compound interest and agrees to pay both the principal and interest in 10 equal annual installments at the end of each year. Find the amount of these installments.

[Marks: (6+4) = 10]

Q. No. 3

(a) There are 10 professors and 20 students out of whom a committee of 2 professors and 3 students is to be formed. Find the number of ways in which this can be done. Further in how many of these committees (i) a particular professor is included? (ii) a particular student is excluded?

(b) The total revenue function for a particular product is $R = 600q - 0.5q^2$. The total cost for the product is $C = 1500 + 150q - 4q^2 + 0.5q^3$. Determine the profit function and the value of q for which profits are maximum.

[Marks: (5+5) = 10]

Q. No. 4

(a) Prove that $\frac{cosA + cosB}{sinA - sinB} + \frac{sinA + sinB}{cosA - cosB} = 0.$

(b) If $V = \sqrt{x^2 + y^2 + z^2}$ then show that $V_{xx} + V_{yy} + V_{zz} = 2/V$

[Marks: (3+7) = 10]

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Q. No. 5

(a) A manufacturer produces three products: P, Q and R which he sells in two markets. Monthly sales volume are as follows:

Markets	Products		
	P	Q	R
I	10,000	2,000	18,000
II	6,000	20,000	8,000

If unit sale prices of P, Q and R are Taka 250, 125 and 150 respectively, find the total revenue in each market with the help of Matrix Algebra.

If the unit costs of the above 3 commodities are Taka 180, 120 and 80 respectively, find his gross profits.

(b) What do you understand by matrix? Why is it important in business world?

[Marks: (6+4) = 10]

Q. No. 6

(a) If A $= \begin{pmatrix} 9 & 1 \\ 4 & 3 \end{pmatrix}$, B $= \begin{pmatrix} 1 & 5 \\ 7 & 12 \end{pmatrix}$, then find the matrix X such that

2 A + 3 B + 5X = 0.

(b) Solve :$(x - \frac{1}{x})^2 - 6\left(x + \frac{1}{x}\right) + 12 = 0$.

(c) Find the equation of the straight line perpendicular to the line

42 x - 33 y + 117 = 0 and passing through the point (1 , 1).

[Marks: (3+4+3) = 10]

Q. No. 7

(a) An insurance company examined the records of a group of individuals hospitalized for a particular illness. It was found that the total proportion discharged at the end of t days of hospitalization is given by

$$f(t) = 1 - \left(\frac{200}{200 + t}\right)^3$$

Evaluate (i) f(0), (ii) f(100) and (iii) f(800), (iv) at the end of how many days was half of the group discharged?.

(b) Find (i) $\int (\sqrt[3]{x} - \frac{1}{3}x + \frac{2}{\sqrt{x}})\, dx$

(ii) $\int \frac{dx}{\sqrt{4 - x^2}}$

[Marks: (6+4) = 10]

PART –B: BUSINESS STATISTICS

Q. No. 1

(a) Discuss the role of business statistics in the management of a business enterprise. State the limitations of business statistics in brief.

(b) Write down the frequency table from the following data and hence calculate (i) Mean, (ii) Median, (iii) Mode.

55	22	45	78	80	65	55	89	63	54	68	32
63	55	45	42	33	36	33	25	46	39	41	42
61	78	58	68	92	56	52	54	45	46	48	49
52	53	54	55	72	71	22	46	47	75	73	

[Marks: 4+6]

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Q. No. 2

(a) What is coefficient of variation? What are its advantages over the other measures of dispersion? If the average score of male students is 3.0 and the standard deviation of their scores is 0.25, and if the corresponding figures for female students are 2.9 and 0.25, do the scores of male students are in greater variability? Why?

(b) In a survey, data on daily wages paid to workers of two factories A and B are as follows:

Daily Wages	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Factory A	15	30	44	60	30	14	7
Factory B	25	40	60	35	20	15	5

Find out:

(i) Which factory pays higher average wages?

(ii) Which factory has greater variability about paying wages?

[Marks: (4+6) = 10]

Q. No. 3

(a) Define scatter diagram. Explain the usefulness of using scatter diagram in studying the correlation between two variables.

(b) 500 Units from factory 'A' are inspected and 12 are found to be defective. 800 units from factory 'B' are inspected and 12 are found to be defective. Can it be concluded at 5% level of significance that production at factory 'B' is better than in factory 'A'?

[Marks: (4+6) = 10]

Q. No. 4

(a) Define the following terms with examples:

(i) Test of hypothesis (ii) Type-I and Type-II error (iii) One-tailed test and Two-tailed test

(b) The following data give the test scores and sales made by nine salesmen during the last one year:

Test Scores	14	19	24	21	26	22	15	20	19
Sales(Tk.000)	31	36	48	37	50	45	33	41	39

Obtain (i) the regression equation of test scores on sales, (ii) The regression equation of sales on test scores.

[Marks: (3+7) = 10]

Q. No. 5

(a) What do you mean by the terms skewness and kurtosis? Point out their role in analyzing a frequency distribution.

(b) The following table gives the distribution of monthly wages of 500 workers in a small factory.

Monthly wages (Tk. hundred)	**No. of workers**	**Monthly wages (Tk. hundred)**	**No. of Workers**
15-20	10	30-35	220
20-25	25	35-40	70
25-30	145	40-45	30

Compute Karl pearson's coefficient of skewness.

[Marks: (4+6) = 10]

Q. No. 6

(a) Define probability of an event. State the elementary properties of probability. Prove the additive Law of probability.

(b) Two Factories manufacture the same machine part. Each part is classified as having either 0, 1, 2 or 3 manufacturing defects. The joint probability distribution for this is given below:

	Number of defects			
	0	**1**	**2**	**3**
Manufacturer A	0.1250	0.0625	0.1875	0.1250
Manufacturer B	0.0625	0.0625	0.1250	0.2500

(a) A part is observed to have no defects. What is the probability that it was produced by manufacturer B?

(b) A part is known to have been produced by manufacturer A. What is the probability that the part has no defects?

(c) A part is known to have two or more defects. What is the probability that it was manufactured by A?

(d) A part is known to have one or more defects. What is the probability that it was manufactured by B?

[Marks: (4+6) = 10]

Q. No. 7

(a) Distinguish with examples, between

(i) Data and Information

(ii) Sample and Population

(iii) Discrete variable and Continuous variable

(b) Explain the following concepts:

(i) Positive correlation

(ii) Negative correlation

(iii) Zero correlation

(c) Given the frequency distribution below. Draw the histogram.

Class interval	10-30	30-50	50-70	70-90	90-110	110-130
Frequency	5	8	12	18	3	2

[Marks: (3+3+4) = 10]

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