

**CMA DECEMBER, 2019 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 Unilever survey of 2,000 people, the following information is found:

- 1,200 people like Sunsilk
- 980 like all clear
- 740 like Meril
- 520 like Sunsilk and all clear
- 420 like Sunsilk and Meril
- 340 like all clear and Meril and
- 260 like all three

Find out:

- (i) How many people does not like all three?
 - (ii) How many people like only Meril?
- (b) If $a^{2x-1} = b^{1-3y}$ and $a^{3x-1} = b^{2y-2}$, show that $13xy = 7x + 5y - 3$.

[Marks: (5+5) = 10]

Q. No. 2

- (a) If $\log \frac{x+y}{3} = \frac{1}{2}(\log x + \log y)$; then show that $\frac{x}{y} + \frac{y}{x} = 7$
- (b) Solve the equation:

$$\sqrt{\frac{x}{x+16}} + \sqrt{\frac{x+16}{x}} = \frac{25}{12}$$

[Marks: (5+5) = 10]

Q. No. 3

- (a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 5 & 12 \end{bmatrix}$, then show that, $A.A^{-1} = I$
- (b) Find the equation of the line which passes through the points (3,1) and the intersection of the lines $4y - 3x + 22 = 0$ and $x - y - 6 = 0$.

[Marks: (5+5) = 10]

Q. No. 4

- (a) A committee of 5 members is to be formed out of 5 males and 6 females. Find the number of ways in which it can be done so that among the members chosen in the committee there are:
- (i) 3 males and 2 females
 - (ii) 2 males
 - (iii) No female
 - (iv) At least one female
 - (v) Not more than 3 males
- (b) Assume that the interest rate is 6% per annum. Then how much money do you need to invest to make difference between simple interest and compound interest for 2 years be Tk. 13.50. Also find the amount of simple interest and compound interest.

[Marks: (5+5) = 10]

Q. No. 5

- (a) Find $\frac{dy}{dx}$, given that (i) $y = x^3 \sin x$, (ii) $y = \frac{\log x}{\sin x}$.
- (b) If $u(x, y) = x^2 - y^2 - 2xy - 2x + 3y$, find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.
- (c) If $x^y = e^{x-y}$, prove that $\frac{dy}{dx} = \frac{\ln x}{(1 + \ln x)^2}$.

[Marks: (1.5+1.5)+4+3 = 10]

Q. No. 6

- (a) Demand for goods of an industry is given by the equation $pq = 100$ where p is the price and q is the quantity. Supply is given by the equation $20 + 3p = q$. What is the equilibrium price and quantity?
- (b) Determine whether the function $y = 3x^2 - 25$ is increasing or decreasing at the point $x=3$.
- (c) If one root of the equation $3x^2 - kx + 4 = 0$ is 3 times the other, find the value of k .

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

Q. No. 7

- (a) Total cost of production of x units $\frac{x^3}{3} - 6x^2 - 4x + 100$ and sales revenue $(8-4x)$. How many products are to be produced to earn maximum profit?
- (b) Evaluate of the following integrals:
- (i) $\int \frac{2}{x(2-x)} dx$, (ii) $\int \frac{dx}{(1+x^2)\sqrt{\tan^{-1} x + 3}}$;
- (c) Mr. Samium borrows Tk. 100,000 from Eastern Bank Limited at 12% compound interest rate which will be repaid over next 4 years. Payment will be made in equal installment at the end of each month. How much he needs to pay in each installment?

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

PART-B: BUSINESS STATISTICS

Q. No. 1

- (a) Explain how statistics is useful in the decision making process of business and management.
- (b) Distinguish between the following:
- (i) Sample and Population (ii) Skewness and Kurtosis (iii) Statistic and parameter
 (iv) Histogram and bar diagram.

[Marks: 2+ (2 x 4) = 10]

Q. No. 2

- (a) What are the various measures of central tendency? Why are they called measures of central tendency? .
- (b) When median is the best measure of frequency distribution?
- (c) What is co-efficient of variation?
- (d) The prices of a company shares in Dhaka and Chittagong stock markets during the last ten months are recoded below:

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.
Dhaka(Tk.)	105	120	115	118	130	127	109	110	104	112
Chittagong(Tk.)	108	117	120	130	100	125	125	120	110	135

- (i) Determine the arithmetic mean and standard deviation of the prices of shares of each market.
- (ii) In which market are the shares prices stable?

[Marks: (2+1+1+6) = 10]

Q. No. 3

- (a) In a certain town, male and female each form 50% of the population. It is known that 20% of the males and 5% of the females are unemployed. A research student studying the employment situation selects an unemployed person at random. The probability data given in table below-

Unemployment data

	Unemployed	Employed	Total
Males	0.100	0.400	0.500
Females	0.025	0.475	0.500
Total	0.125	0.875	1.000

What is the probability that the person so selected is (a) male (b) female?

- (b) Length of service in years (X) and the efficiency grades (Y) of eight individual officers of a company are given below:

Serial No.	1	2	3	4	5	6	7	8
Length of service in years (X)	16	12	18	4	3	10	5	12
Efficiency (Y)	23	22	24	17	19	20	18	21

Calculate the karlpearson's co-efficient of correlation and comment on the result.

[Marks: (5+5) = 10]

Q. No. 4

- (a) A study of 241 authors revealed the following data on the distribution of age:

<u>Age (Years)</u>	<u>Number of Authors</u>
Up to 30	20
Up to 40	73
Up to 50	80
Up to 60	44
Up to 70	22
Up to 80	2

Compute the mean, standard deviation and co-efficient of variation of the distribution.

- (b) A Tax firm is interested in comparing the quality of work at two of its regional offices. By randomly selecting samples of tax returns prepared at each office and verifying the sample returns accuracy, the firm will be able to estimate the proportion of erroneous returns prepared at each office. Independent random samples from the two offices provide the following information:

	Sample size	Number of returns with errors
Office I	250	35
Office II	300	27

Conduct a hypothesis test to determine whether the error proportions differ between the two offices. ($\alpha = 0.10$)

[Marks: (5+5) = 10]

Q. No. 5

- (a) Write down the difference between Discrete variable and Continuous Variable.
 (b) From the following data, draw a Histogram, a frequency polygon and a frequency curve:

Age of Service Limited	Below-5	5-10	10-15	15-20	20-25	25-30	30-35
No. of Workers	5	12	25	48	32	6	1

- (c) A machine will function only when all the three components A, B and C will work. The probability of a failing during one year for A is 0.15, that of a B is 0.05 and that of C is 0.10.

What is the probability that the equipment will fail before the end of the year?

[Marks: (2+5+3) = 10]

Q. No. 6

- (a) What is test of hypothesis? Explain type-I error and type-II error with table.
(b) The nine items of a sample had the following values:

45 47 50 52 48 47 49 53 50

The sample mean is 49 and the sum of squares of deviation taken from mean is 52. Can this sample be regarded as taken from the population having 47 as mean? Also find 95% confidence interval. The table value of 't' for 8 degree of freedom at 5% level is 2.31.

[Marks: (3+7) = 10]

Q. No. 7

- (a) Calculate the skewness from the following data and comment on the result:

Income (Tk.)	200-300	300-400	400-500	500-600	600-700	700-800	800-900
No. of Worker	3	10	25	18	12	7	4

- (b) Suppose the head office of Janata Bank Ltd. Collects information of 300 working days from several branch offices operating throughout Bangladesh and the number of frauds found are like that

Number of Fraud	0	1	2	3	4
Number of Days	35	85	120	45	15

Required:

- (i) Find the probability distribution of daily fraud occurred?
(ii) What is the probability of not occurring fraud in a day?
(iii) What is the probability of occurring at least one fraud in a day?

[Marks: (4+6) = 10]

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