



THE INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF BANGLADESH
CMA DECEMBER, 2017 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) If $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, $S = \{1, 3, 4\}$ and $T = \{2, 4, 5\}$, verify that $(A \times B) \cap (S \times T) = (A \cap S) \times (B \cap T)$.
- (b) The total cost y , for x units of a certain product consists of fixed cost and variable cost. It is known that the total cost is Tk.6000 for 500 units and Tk. 9000 for 1000 units.
- (i) Find the linear relationship between x and y ,
 - (ii) Find the slope of the line, what does it indicate?
 - (iii) Find the number of units that must be produced so that
 - (1) There is neither profit nor loss.
 - (2) There is a profit of Tk.1000.
 - (3) There is a loss of Tk.300; it being given that the selling price is Tk. 8 per unit.

[Marks: (4+6) = 10]

Q. No. 2

- (a) A sum of Tk. 50,000 invested for 4 years at 5% interest per annum compounded quarterly. Find the effective rate of interest per annum.
- (b) Mr. Abid can purchase a machine by paying Tk. 4,00,000 in cash now. He can also purchase the machine by 8 equal yearly installments to be paid at the beginning of each year. If the interest rate is 10% what should be amount of each installment?

[Marks: (4+6) = 10]

Q. No. 3

- (a) If α , β are the roots of the equation $(a+b+c)x^2+(b+2c)x+c = 0$ form the equation whose roots are $\frac{\alpha}{\alpha+1}$ and $\frac{\beta}{\beta+1}$.
- (b) There are 12 books of the same author, 5 copies of Business Mathematics, 4 copies of Statistics and 3 copies of Business Communications. In how many ways it is possible to make a selection by taking some or all of the books?

[Marks: (5+5) = 10]

Q. No. 4

- (a) Solve the following system using the inverse matrix:

$$\begin{aligned} 3x + y + z &= 1 \\ 2x + 2z &= 0 \\ 5x + y + 2z &= 2 \end{aligned}$$

- (b) Solve the equation $\log_{10} (3x+2) - 2 \log_{10} x = 1 - \log_{10} (5x-3)$.

[Marks: (6+4) = 10]

Q. No. 5

- (a) The profit made by a company that produces and sells x barrels of octane is $p(x)$ taka, where $p(x) = 100x - 0.01x^2 - 120,000$.
- (i) What should be x if profit is to be maximized?
 - (ii) What is the amount of the maximum profit?
- (b) If $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$, prove that $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$.

[Marks: (6+4) = 10]

Q. No. 6

- (a) If $x^y = e^{x-y}$, prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$
- (b) If $x^3 - 3x^2 y + 2y^2 - 5 = 0$, find $\frac{dy}{dx}$.

[Marks: (5+5) = 10]

Q. No. 7

- (a) A company's loss is Tk. 121.50 in a certain year. Marginal Revenue and Marginal Cost of the company are $MR = 30-6x$ and $MC = -24+3x$, respectively. Find profit function, break-even point and middle point between break-even.
- (b) Integrate $\tan x$ with respect to x .

[Marks: (7+3) = 10]

PART – B: BUSINESS STATISTICS

Q. No. 1

- (a) Define statistics? Discuss the uses of statistical methods in modern business organizations.
- (b) Define variable with its classification. Discuss different measurement scale used in statistics and mention which variable includes in which scale:
 (i) Height, (ii) IQ score, (iii) Economic status, (iv) Jersey number, (v) Income.

[Marks: (5+5) = 10]

Q. No. 2

- (a) What do you mean by measures of central tendency? What are their measures? Among all measures of central tendency which one is the best and why?
- (b) In an examination of 675 candidates the examiner submitted the following information:

Marks obtained	No. of candidates
Less than	
10%	7
20%	39
30%	95
40%	201
50%	381
60%	545
70%	631
80%	675

Calculate the mode and median of the percentage marks obtained.

[Marks: (4+6) = 10]

Q. No. 3

- (a) Define mean deviation and standard deviation. Why standard deviation is the best measure of dispersion?
- (b) Life of two models of refrigerators in a recent survey are:

Life in years	Number of refrigerators	
	Model A	Model B
0 – 2	5	2
2 – 4	16	7
4 – 6	13	12
6 – 8	7	19
8 – 10	5	9
10 - 12	4	1

What is the average life of each refrigerator? Which model of refrigerator is more stable and why?

[Marks: (4+6) = 10]

Q. No. 4

- (a) Distinguish between correlation and regression.
(b) The following data gives the information on sales and advertising expenses for last 6 months of a particular furniture shop. The data were recorded as follows:

Advertising expenses (million \$)	2	4	5	3	8	6
Sales revenue (million \$)	17	21	27	18	45	29

- (i) Draw a scatter diagram;
(ii) Fit a linear regression model;
(iii) Estimate the sales revenue if advertisement expense is 20 lac taka.

[Marks: (3+7) = 10]

Q. No. 5

- (a) What is a time series? What are the components of time series? Explain briefly.
(b) The following are the annual profit (in million) in a business firm from 2000 to 2006:

Year :	2000	2001	2002	2003	2004	2005	2006
Profit (Tk.):	12	9	15	19	26	15	30

- (i) Use the method of least squares to fit a straight line to the above data.
(ii) Estimate the profit for the year 2010 and comment on the estimate

[Marks: (4+6) = 10]

Q. No. 6

- (a) Define critical value with examples and distinguish between one tail test and two tail test graphically.
(b) Explain the following:
(i) Random variable (ii) random experiment (iii) mutually exclusive events and (iv) equally likely events.
(c) On the average, one in 400 items is defective. If the items are packed in boxes of 100, what is probability that any given box will contain
(i) No defectives;
(ii) Less than two defectives;
(iii) One or more defectives.

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

Q. No. 7

- (a) Define normal distribution with their important properties. What types of error are committed in testing hypothesis? What about the power of the test?
(b) An internet server claims that its users spend on the average of 20 hours per week with a standard deviation of 3 hours on the information superhighway. To determine whether this is an overestimate, a competitor conducted a sample survey of 15 customers and found that the average time spent online was 22 hours per week. Do the data provide sufficient evidence to indicate that the average hours of use are less than that claimed by the first internet? Test at 5% level of significance.

[Marks: (5+5) = 10]

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