

**CMA JUNE, 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) If $A = \{a, b\}$, $B = \{p, q\}$ and $C = \{q, r\}$

Find (i) $A \times (B \cup C)$ (ii) $(A \times B) \cup (A \times C)$
 (iii) $A \times (B \cap C)$ (iv) $(A \times B) \cap (A \times C)$

(b) A Company studies the product preferences of 20,000 consumers. It was found that each of the products A, B, C was liked by 7420, 6230 and 5980 respectively and all the products were liked by 1500. Products A and B were liked by 2580, products A and C were liked by 1200 and products B and C were liked by 1950. Prove that the study results are not correct.

[Marks: (6+4) = 10]

Q. No. 2

(a) Mr. Shahriar has option of buying a house for Tk. 1 crore on condition that he has to pay Tk. 20 lakh now and the rest of the amount will need to pay with 240 monthly installments, with installments at the end of each month, @9% annual compound interest. Find the value of each installment.

(b) Prove that,

$$\log_3 8 / (\log_9 16 \log_4 10) = 3 \log_{10} 2$$

[Marks: (5+5) = 10]

Q. No. 3

(a) Find the condition that the roots of the equation $ax^2+bx+c = 0$ may differ by 5.

(b) Find the inverse of matrix

$$A = \begin{pmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 3 & 3 & 2 \end{pmatrix}$$

[Marks: (5+5) = 10]

Q. No. 4

(a) If $x = 3 + 2\sqrt{2}$ and $y = 1/(3+2\sqrt{2})$, find the value of $5x^2+10xy+5y^2$.

(b) Mr. Kamal has two investments. He gets 8% interest from XY investment and 10% interest from YZ investment. His total annual return is of Tk. 740. If interest rate changes, i.e. 10% return from XY investment and 8% return from YZ investment, then total return will be Tk. 700. Find the total investment.

[Marks: (5+5) = 10]

Q. No. 5

(a) A firm invested Tk. 20,000 in a new factory that has a net return of Tk. 2,000 per year. An investment of Tk. 40,000 would yield a net income of Tk. 8,000 per year. What is the linear relationship between investment and annual income? What would be the return on an investment of Tk. 30,000?

(b) Show that, $(xy)^{\ln x - \ln y} \times (yz)^{\ln y - \ln z} \times (zx)^{\ln z - \ln x} = 1$

[Marks: (5+5) = 10]

Q. No. 6

- (a) A cricket team of 11 players is to be formed from 16 players including 4 bowlers and 2 wicket-keepers. In how many different ways, we can form a team so that the team includes-
- (i) Exactly 3 bowlers and 1 wicket-keeper
 - (ii) At least 3 bowlers and at least 1 wicket-keeper.
- (b) If $y = (\cos^{-1} x)^2$, then prove that, $(1 - x^2)y_2 - xy_1 = 2$.

[Marks: (5+5) = 10]

Q. No. 7

- (a) Beximco Manufacturing Company has examined its cost and revenue structures and determined that total cost C, total revenue R and the number of units produced x are related as follows: $C = 100 + 0.015x^2$ and $R = 3x$. Find the level of production that will maximize profit of the company. Also find the profit when $x = 120$.
- (b) Evaluate:

a. $\int_2^4 \frac{x}{x^2+5} dx$

b. $\int_0^5 (e^x + e^{-x}) dx$

[Marks: (5+5) = 10]

PART-B: BUSINESS STATISTICS

Q. No. 1

- (a) The marks in Math of 40 students in class ten of a school is:

54	56	56	59	60	62	62	66	67	68
68	70	70	73	73	73	75	77	52	79
79	81	78	68	63	53	50	56	66	58
59	58	68	60	61	63	60	54	78	68

- (i) Construct a frequency distribution table by taking class interval ten under inclusive method.
 - (ii) Calculate the Mean, Median and Mode of the distribution.
- (b) Describe the meaning, application and importance of Statistics in modern Economy.

[Marks: (6+4) = 10]

Q. No. 2

- (a) Explain with example the following concepts:
- (i) Positive correlation
 - (ii) Negative correlation
 - (iii) Zero correlation.
- (b) The following data about the sales and advertisement expenditure of a firm is given.

	Sales (Lakh Taka)	Advertisement Expenditure (Lakh Taka)
Mean	40	6
S.D	10	1.5
r	+0.9	

- (i) Estimate the likely sales for a proposed advertisement expenditure of Taka 10 lakh.
- (ii) What should be the advertisement budget if the company wants to attain a sales target of Taka 60 lakh.

[Marks: (5+5) = 10]

Q. No. 3

- (a) What are the different measures of variation? Why standard deviation is considered to be the best measure?
- (b) The following data give the test scores and sales made by nine salesman 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: (4+6) = 10]

Q. No. 4

- (a) Explain the role and components of Time Series Analysis.
- (b) Formulate different multiplicative relationship model between the four components.
- (c) Assuming that Trend is absent, determine if there is any seasonality in the data given below:

Year	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
2015	3.7	4.1	3.3	3.5
2016	3.7	3.9	3.6	3.6
2017	4.0	4.1	3.3	3.1
2018	3.3	4.4	4.0	4.0

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

Q. No. 5

- (a) What does standard deviation measure? How does it differ from mean deviation? Which one of these two measures is more advantageous for statistical purpose and why?
- (b) Fit a straight line trend by the method of least squares to the data given below:

Year	:	2008	2009	2010	2011	2012	2013	2014
Sales (m. tonnes)	:	9	11	13	12	14	15	17

Estimate the likely sales for the year 2017.

[Marks: (4+6) = 10]

Q. No. 6

- (a) Explain the meaning of 'Central Tendency'. "Population of a country increases in Geometric Progression" - do you agree with this statement? Explain the uses of Geometric mean.
- (b) The sales data of an item in six shops before and after a special promotional campaign are as under:

Shops	:	A	B	C	D	E	F
Before Campaign	:	53	28	31	48	50	42
After Campaign	:	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% Level of significance.

[Marks: (4+6) = 10]

Q. No. 7

- (a) Distinguish between One-Tailed Test and Two-Tailed Test.
- (b) Distinguish between Sampling Error and Non-Sampling Error.
- (c) A box contains 8 red, 3 white, and 9 blue balls. If 3 balls are drawn at random without replacement, determine the probability that- (i) all 3 are red, (ii) all 3 are white, (iii) 2 are red and 1 is white, (iv) at least 1 is white, (v) 1 of each color is drawn.

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

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