THE INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF BANGLADESH
CMA DECEMBER, 2016 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)   Mr. Jahir wants to purchase a machine after 10 years when it will cost Tk. 10,00,000.00. From now, he wants to save money for the machine and plans to deposit money into a bank in 10 equal installments, the first deposit to be made immediately. Calculate the amount of each installment reckoning compound interest at 10% p.a.

(b)   Let A = $\begin{pmatrix} 3 & 2 \\ -1 & 0 \end{pmatrix}$

Show that $A^2 – 3A+2I = O$, when I is the unit matrix of order 2x2 and O is the null matrix of order 2x2

[Marks: (6+4) = 10]

Q. No. 2.
(a)   A person borrows Tk. 20,00,000 on the understanding that he will pay it back in 72 equal monthly installments at the end of each month. If money is worth 14% per annum compounded monthly, find the value on an installment.

(b)   Find $\dfrac{dy}{dx}$ for $e^{x+y} – y^2 \log x^3 = 15$.

[Marks: (5+5) = 10]

Q. No. 3.
(a)   A question paper contains 5 questions each having an alternative. In how many ways can an examinee answer one or more questions?

(b)   A company studies the product preferences of 25,000 consumers. It was found that each of the products A, B and C was liked by 8,000, 7,000 and 6,000 respectively and all the products were liked by 1500. Products A and B were liked by 2000 and products B and C were liked by 2200. Prove that the study results are not correct.

[Marks: (4 + 6) = 10]

Q. No. 4.
(a)   (i)   If $y = e^{\tan^{-1} x}$ then show that,

(1 + x^2) y_2+(2x-1)y_1 = 0
       (ii)   Find third derivative of the function $y = 3x^3 – 5x^2 + 2$.

(b)   A firm sells all of its product at the rate of Tk. 4 each. The cost function (C) for x units of production is $C = 50+1.3x+0.001x^2$
       (i)   Determine its profit function.
       (ii)   Determine the unit of production for maximum profit.
       (iii)   Find its total profit.

[Marks: (4 + 6) = 10]

Q. No. 5.
(a)   A farmer with 4000 meters of fencing wants to enclose a rectangular plot that borders on a river. If the farmer does not fence the side along the river, what is the largest area that can be enclosed?

(b)   Prove that $\dfrac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \dfrac{1+\sin \theta}{\cos \theta}$

[Marks: (5+5) = 10]

Q. No. 6.

(a) If the equations $x^2+px+q = 0$ and $x^2+qx+p = 0$ have a common root, show that their other roots are the roots of the equation $x^2+x+pq = 0$.

(b) The cost of producing 200 pens is Tk. 1000 and the cost of producing 400 pens is Tk.1500 (i) Find the linear relation between the cost y of producing x pens (ii) what number of pens must be produced and sold at Tk. 3 per pens, so that there is neither profit nor loss? (iii) What should be the selling price of a pen if 600 pens are produced and sold with a profit of Tk. 400.?

[Marks: (5+5) =10]

Q. No. 7.

(a) Carryout the following: (i) $\int \dfrac{e^x dx}{\sqrt{1-e^{2x}}}$ (ii) $\int \dfrac{x}{\sqrt{2x+1}} dx$

(b) In a survey of 400 TV audiences, it was found that 150 regularly watch drama serial, 250 watch news program and 75 watch neither of these. How many watch the drama serial alone? How many watch news program alone?

[Marks: (6+4) = 10]

PART – B: BUSINESS STATISTICS

Q. No. 1.

(a) "Without adequate understanding of Statistics, the investor in Social Science may frequently be like the blind man groping in a dark closet for a black cat that is not here." Comment on this statement.

(b) Distinguish between with example: (i) Inclusive data and Exclusive data (ii) Sample and Population (iii) Parameter and statistic.

(c) Form a good questionnaire on the basis of the opinion of the inhabitants nearer to the projected Padma bridge about the effects on the socio-economy of the southern area people and the overall economy of the country for the bridge which are under construction over the river Padma.

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

Q. No. 2.

(a) What are the various measures of central tendency? Why are they called measures of central tendency?

(b) "Every average has its own peculiar characteristics. It is difficult to say which average is the best." Comment briefly.

(c)

Age Interval	Male(thousands)(Frequency-F1)	Female(thousands)(Frequency-F2)
18-19	121	481
20-24	2441	4184
25-29	5930	6952
30-34	6587	7193
35-44	11788	11893
45-54	9049	9022
55-64	8749	8171
65-74	5786	4654
75 &over	2581	1524

The above table shows the total number of marriages in the USA for male & female of different age groups during a certain year.

(i) Find the median ages of male & females for these marriages.

(ii) Why is the median a more suitable measure of central tendency than the mean in this case?

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

Q. No. 3.
(a) What are the absolute & relative measures of dispersion? Explain.
(b) When co-efficient of variation is more useful than the standard deviation?
(c) A manufacturer produce two types of bulbs, A & B, respectively, the bulb have average mean life times of $\bar{Y}_A$ =1495 hours & $\bar{Y}_B$ =1875 hours & standard deviation of S_A=280 hours & S_B = 310 hours.
Which bulb has the greater (a) absolute dispersion? (b) relative dispersions? Comment on which bulb is the better.

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

Q. No. 4.
(a) Distinguish between correlation and regression analysis? What is scatter diagram? Explain the following values of 'r' with the help of diagrams:
(i) $r = 0$, (ii) $r = -0.8$, (iii) $r = +0.9$.
(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 expense (million $) x	2	4	5	3	8	6
Sales revenue (million $), y	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 12 million.

[Marks: (4+6) = 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 (million taka) 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) What is hypothesis? What steps are necessary to follow hypothesis testing as statistical tools?
(b) Explain the level of significance with example.
(c) You are working as a purchase manager for a Company. The following information has been supplied to you by two manufacturers of electric bulbs.

Particulars	Company -A	Company-B
Mean life (in hours)	1300	1200
Standard deviation	80	90
Sample size	110	110

Which brand of bulbs are you going to purchase if your desire to take a risk of 5%?

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

Q. No. 7.
(a) Define normal distribution with their important properties. What type of errors are committed in testing hypothesis? What about the power of the test?
(b) An internet server claims that its users spend on the average 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.

[Marks: (5+5) = 10]

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