

CMA APRIL, 2019 SPECIAL 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) From the statistics of 45 students of a class it was revealed that 25 students took Mathematics, 21 took Economics and 15 took Law courses. Of them 12 took Mathematics and Economics, 9 took Mathematics and Law and 7 took Economics and Law, 3 took Mathematics, Economics and Law.
- (i) How many took only Mathematics but not Economics and Law?
- (ii) How many did not take any course at all?
- (b) The ABC's have a new born daughter and have decided to start saving for her college education. They estimate she will attend school for 4 years and her schooling will cost Tk. 300, 000 per year. They will deposit a fixed amount of money into a savings account at the end of each year for 18 years. The Tk.300, 000 will come due at the end of each of the 19th, 20th, 21st, and 22nd years. They estimate that they will be able to invest at a nominal interest rate of 4% compounded annually during the entire 22 years. How much money will they need to deposit at the end of each year for the first 18 years?

[Marks: (4+6) = 10]

Q. No. 2

- (a) A country contains a city and its suburbs. The population of the city is 35,00,000 and is decreasing by 2,00,000 each year. The population of the suburbs is 18,00,000 and is increasing by 1,00,000 each year. When will the city and the suburbs have equal populations?
- (b) Nick recently graduated and got his first real job. He decides to set up a retirement fund. He will deposit \$1500 into this account at the end of each quarter from now until retirement. He will retire in 40 years. His retirement fund will earn 12% interest compounded quarterly. How much will his retirement fund be worth when he retires?

[Marks: (4+6) = 10]

Q. No. 3

- (a) Solve the equation: $4(2^x + 2^{-x}) = 17$
- (b) Mr. XYZ just retired. His company pension plan will pay him Tk.20,000 at the end of each month for the next 15 years. He asks if he can receive the entire balance of his pension account today, so that he can merge this with other investments. How much money should his company give him today? Assume that the rate to other similar types of investments is 10%.

[Marks: (4+6) = 10]

Q. No. 4

- (a) The roots of the equation $2x^2 + x + 5 = 0$ are α and β and those of $2x^2 - 3x + 2b = 0$ are $(\alpha + 1)$ and $(\beta + 1)$. Determine the value of b .
- (b) The yearly profits of ABC company are dependent upon number of workers(x) and the number of units of advertising (y) according to the function $P(x,y) = 412x + 806y - x^2 - 4y^2 - xy - 50,000$.

Determine:

- (i) the number of workers and the number of units in advertising that results in maximum profit.
- (ii) the maximum profit.

[Marks: (4+6) = 10]

Q. No. 5

- (a) Prove that, $2(\sin^6 A + \cos^6 A) - 3(\sin^4 A + \cos^4 A) + 1 = 0$.
- (b) A question paper consists of 10 questions divided into two parts A and B. Each part contains five questions. A candidate is required to attempt six questions in all of which at least 2 should be from part A and at least 2 from part B. In how many ways can the candidate select the questions if he can answer all questions equally well?

[Marks: (5+5) = 10]

Q. No. 6

- (a) Find the number of years in which a sum of money will treble itself at compound interest at 8 percent per annum.
- (b) Evaluate:

$$\int_1^2 (e^{2x} + 3x^2) dx$$

[Marks: (5+5) = 10]

Q. No. 7

- (a) Find differential coefficient with respect to x:

1. $\frac{1 + \cos x}{\sin x}$

2. $3\sqrt{x} \sin x$

- (b) Suppose the marginal revenue function and the marginal cost function are $R(x) = 150 - x$ and $C(x) = \frac{1}{10}x^2 - 4x + 110$ respectively and the total cost is Tk. 4,000 for 30 units of production.
- (i) What is the fixed cost of the production?
- (ii) Find the profit function in terms of output x.
- (iii) At what level of output, the profit is maximum?

[Marks: (4+6) = 10]

PART – B: BUSINESS STATISTICS

Q. No. 1

- (a) Distinguish, with example, between: (i) Data and Information (ii) Sample and Population (iii) Discrete variable and Continuous variable (iv) Histogram and Ogive.
- (b) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001. Determine the probability that out of 2000 Individuals. (i) Exactly 3 and (ii) More than 2 individuals will suffer a bad reaction.

[Marks: (4+6) = 10]

Q. No. 2

- (a) What is Co-efficient of variation? What purpose does it serve? Discuss its importance in business problems.
- (b) Calculate the arithmetic mean, median and standard deviation for the Following distribution:

| Height (inches) | No of persons | Height (inches) | No of persons |
|-----------------|---------------|-----------------|---------------|
| 60 less than 63 | 4 | 69 less than 72 | 33 |
| 63 Less than 66 | 14 | 72 Less than 75 | 8 |
| 66 Less than 69 | 59 | 75 Less than 78 | 2 |

[Marks: (4+6) = 10]

Q. No. 3

- (a) Explain the term variation. What purpose does a measure of variation serve? In the light of these, comment on some of the well-known measures of variation.
- (b) Calculate the co-efficient of correlation and its probable error from the following:

| Sl. No | Subject | % Marks in final Year exams | % Marks in seasonal |
|--------|------------|-----------------------------|---------------------|
| 1 | Hindi | 75 | 62 |
| 2 | English | 81 | 68 |
| 3 | Physics | 70 | 65 |
| 4 | Chemistry | 76 | 60 |
| 5 | Maths | 77 | 69 |
| 6 | Statistics | 81 | 72 |
| 7 | Botany | 84 | 76 |
| 8 | Zoology | 75 | 72 |

[Marks: (4+6) = 10]

Q. No. 4

- (a) Describe the Addition law & Multiplication law of probability and dependent & Independent events respectively.
- (b) A market researcher of a major automobile company classified households by car Ownership. The relative frequencies of the households for each category of ownership are shown in the table:

| No. of Car per household | Relative frequencies |
|--------------------------|----------------------|
| 0 | 0.10 |
| 1 | 0.30 |
| 2 | 0.40 |
| 3 | 0.12 |
| 4 | 0.06 |
| 5 | 0.02 |

Required:

- (i) Establish the probability distribution for the random variable.
- (ii) Calculate the expected value of the random variable.
- (iii) Compute the variance of the distribution.

[Marks: (4+6) = 10]

Q. No. 5

- (a) Distinguish between correlation and regression analysis? Explain the following values of r with the help of diagrams:

(i) $r = 0$, (ii) $r = -0.8$, (iii) $r = +0.9$

- (b) The time series gives below shows the number of T.V. sold by a company since 2005:

| Years: | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| T.V sold (000): | 42 | 50 | 61 | 75 | 92 | 111 | 120 | 127 | 140 | 138 |

Find the linear equation that describes the trend in the number of T.V. sold.

Also estimate the sale of T.V. in 2016.

[Marks: (4+6) = 10]

Q. No. 6

- (a) What is business forecasting? Describe the techniques of forecasting that are commonly used by big business houses.
- (b) A sample of 150 items from machine A had an average life of 1400 hrs. A similar sample of 100 items from machine B had a mean life of 1200 hrs. Past records indicate that the Standard deviation of the items produced by machine A is 120hrs and by machine B is 80 hours. Find 95 percent confidence limits on the difference in the average life time of the population of the items produced by the two machines.

[Marks: (4+6) = 10]

Q. No. 7

Write short notes on the following:

- (a) Probability sampling and non-probability sampling.
- (b) Null Hypothesis and Alternative Hypothesis.
- (c) Binomial distribution and Poisson distribution.
- (d) Type-I error and Type-II error.
- (e) Mathematical expectation.

[Marks: (5×2) = 10]

= THE END =