



THE INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF BANGLADESH  
CMA JUNE, 2017 EXAMINATION  
BUSINESS LEVEL  
SUBJECT: GE 03. FUNDAMENTALS OF BUSINESS MATHEMATICS

Time: Three hours

Full Marks: 100

- ❖ Answer any **FIVE** questions. All questions carry equal marks.
- ❖ Answer must be brief, relevant, neat and clean.
- ❖ Use fresh sheet for answering each question.

**Q. No. 1**

- (a) Solve  $3(9^x - 4 \cdot 3^{x-1}) + 1 = 0$ .
- (b) In the theory of learning curve, you will come across the formula  $y = ax^b$ , calculate  $y$  when  $a = 8$ ,  $x = 5$  and  $b = -0.2$ .
- (c) During a certain year, a company declares a profit of \$15.8 m, whereas, in the previous year, the profit had been \$14.1 m.
- (i) What percentage increase in profit does this represent?
- (ii) A consultant has forecast that the above company's profit figure will fall by 5 per cent next year. What profit figure is the consultant forecasting for the next year?
- (iii) If this year's profit is \$6.2 m, and if the increase from last year is known to have been 7.5 per cent, what was last year's profit?
- (d) Sketch the graph of the quadratic function  $y = 1 + x + 3x^2$ . What does this graph represent?
- (e) Define measures of central tendency with their classifications. What are the characteristics of a good measure of central tendency?

**[Marks: (4+2+6+4+4) = 20]**

**Q. No. 2**

- (a) A man invests Tk. 3,000 initially and then Tk. 1,800 at the end of the first, second and third years, and finally Tk. 600 at the end of the fourth year. If interest is paid annually at 6.5 percent, find the value of the investment at the end of the fifth year.
- (b) A company can purchase a machine now for Tk. 10,000. The company accountant estimates that the machine will contribute Tk. 2,500 per annum to profits for five years, after which time it will have to be scrapped for Tk. 500. Find the NPV of the machine if the interest rate for the period is assumed to be 5 percent. (Assume, for simplicity, that all inflows occur at year ends)
- (c) A company is considering two mutually exclusive projects, the company uses a certainty equivalent approach. The estimated cash flow and certainty equivalents for each project are as follows:

year	Project-1		Project-2	
	Cash flow (Tk.)	certainty equivalents	Cash flow (Tk.)	Certainty equivalents
0	-30,000	1.00	-40,000	1.00
1	15,000	0.95	25,000	0.90
2	15,000	0.85	20,000	0.80
3	10,000	0.70	15,000	0.70
4	10,000	0.65	10,000	0.60

Which project should be accepted if the risk free discount rate is 5 percent?

- (d) Write down the formula required to perform the following calculations.
- (i) A group of 8 people share the cost of a birthday celebration for 34 friends. The price of the meal per person is Tk. 25 plus Tk. 6 for drink and Tk. 4 for coffee. Calculate the amount each of the 8 people will need to pay. Enter all the variables into your calculations and use only one Excel cell.
- (ii) The cost per head of new football shirt and shorts for the village team is Tk. 500 plus Tk. 120 for socks and Tk. 250 for the goalkeeper's gloves. How much will it cost to kit out the full team of 11 players? Enter all the variables into your calculation and use only one Excel cell.

**[Marks: (3+5+5+3.5+3.5) = 20]**

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**Q. No. 3**

- (a) A firm produces 55% of items on production line A and 45% on line B. In general, 3% of the product line A and 5% of that product line B are found to be defective but, once a product is packaged and sold, it is not possible to tell by which line it was manufactured. If an item is subsequently returned as faulty, what is the probability that it was made on line A.
- (b) The probability that a student speaks French fluently is 0.20, the probability that a student speaks Greek is 0.10 and the probability that a student speaks neither language is 0.75. Use Venn diagram to calculate the probability that a student speaks both.
- (c) State three important principles of spreadsheet design.
- (d) A project costs Tk. 36,000 and is expected to generate cash inflows of Tk. 11,200 annually for 5 year. Calculate the IRR of the project.
- (e) As part of its recruitment procedures, a company awards applicants ratings from A (excellent) to D (average) for their interview performance, and marks out of 100 for a writer test. The results of five interviewees are as follows:

Interviewee	Interview grade	Test score
a	A	60
b	B	61
v	A	50
d	C	72
e	D	70

Calculate the Spearman's rank correlation coefficient for the given data set and make a comment on its value.

**[Marks: (5+4+2+5+4) = 20]**

**Q. No. 4.**

- (a) Draw histogram, frequency polygon and cumulative frequency polygon of a frequency distribution of your own choice.
- (b) Find the mean, median and mode for the following distribution:

Size	0-5	5-10	10-15	15-20	20-25	25-30	30-35
Frequency	1	2	5	14	10	9	2

- (c) Discuss different types of correlation with examples.
- (d) An analyst is considering two categories of company, X and Y, for possible investment. One of his assistants has compiled the following information on the price-earning ratios of the shares of the companies in the two categories over the past year:

Price-Earnings Ratios	Number of category X Companies	Number of category Y Companies
4.95 to under 8.95	3	4
8.95 to under 12.95	5	8
12.95 to under 16.95	7	8
16.95 to under 20.95	6	3
20.95 to under 24.95	3	3
24.95 to under 28.95	1	4

Compute the standard deviation of these two distributions. Which company's shares are more uniform?

- (e) Calculate the trend value by the method of least-squares from the data given below and estimate the sales for the year 2017:

year	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
sales of TV sets (in lakh)	12	18	20	23	27

**[Marks: (3+5+3+5+4) = 20]**

**Q. No. 5**

- (a) A market survey conducted in four cities pertained to preference for brand A soap. The responses are shown below.

	Delhi	Kolkata	Chennai	Mumbai
Yes	45	55	60	50
No	35	45	35	45
No opinion	5	5	5	5

- (i) What is the probability that a consumer selected at random preferred brand A?  
 (ii) What is the probability that a consumer preferred brand A and was from Chennai?  
 (iii) What is the probability that a consumer preferred brand A given that he/she was from Chennai?  
 (iv) Given that a consumer preferred brand A what is the probability that he/she was from Mumbai?
- (b) The marks obtained by 10 students in their graduation and the MBA entrance test were found as given below:

Graduation:	50	52	55	60	62	65	65	66	70	75
Entrance test:	52	50	57	65	65	62	65	65	71	78

From the paired data, find the regression equation of  $y$  on  $x$ .

- (c) Calculate the index number by (i) Paasche's method and (ii) Fisher's ideal method.

Commodity	Base year		Current year	
	Price	Qty	Price	Qty
A	6	30	15	40
B	5	40	10	55
C	10	25	12	20
D	4	15	3	30
E	2	50	5	28

- (d) Explain the difference between data and information. Explain how and why indices are used.

**[Marks: (5+5+5+5) = 20]**

**Q. No. 6**

- (a) A company consists of two divisions. In a certain period, the division's profits are forecast to be Tk. 10 m and Tk. 20 m respectively. In the past it is known that such forecasts prove to have maximum errors of 5% and 7% respectively. What is the maximum error in the company's forecast total profits for the period?
- (b) A company has the following data on its sales during the last year in each of its regions and the corresponding number of salespersons employed during this time:

Region	Sales (units)	Salespersons
A	236	11
B	234	12
C	298	18
D	250	15
E	246	13
F	202	10

Develop a linear model for forecasting sales from the number of salespersons.

Q. No. 6 (cont'd.....)

(c) A decision maker is faced with the following options, which can result in the profits shown:

	High Sales P=0.5	Medium Sales P=0.4	Low sales P=0.1
Option 1	Tk. 50,000	Tk. 10,000	(Tk. 60,000)
Option 2	Tk. 40,000	Tk. 10,000	(Tk. 20,000)
Option 3	Tk. 30,000	Tk. 15,000	0

If the intention is to maximize expected profit, which option should be taken? Comment on the riskiness of the choice facing the decision maker.

- (d) The finance department of a multinational company is concerned that ageing machinery on its production line is causing losses by putting too much on average of a certain product into each container. A check on the line shows that the mean amount being put into a container is 499.5 ml, with a standard deviation of 0.8 ml.
- (i) Adopting a normal distribution, what percentage of containers will contain more than the normal contents of 500 ml.
  - (ii) There are two courses of remedial action available: One would reduce the mean amount inserted (leaving the standard deviation unaltered), while the other would reduce the standard deviation (mean unaltered). If the manager wishes to reduce the percentage of containers containing over 500 ml to 10%, how could this be achieved by reducing (1) the mean and (2) the standard deviation amount inserted?

**[Marks: (3+4+5+(3+5) = 20]**

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