ICMAB
THE INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF BANGLADESH

CMA DECEMBER-2018 EXAMINATION
BUSINESS LEVEL
SUBJECT: GE 03. FUNDAMENTALS OF BUSINESS MATHEMATICS

Time Allocated: Three hours | Total Marks: 100

Instructions to Candidates

You are required to answer ALL questions.
Answers should be properly structured, relevant and computations need to be shown.
You are strongly advised to carefully read ALL the question requirements before attempting the question concerned (that is all parts and/or sub-questions).
ALL answers must be written in the answer book. Answers written on the question paper will not be submitted for marking.
Start answering each question from a fresh sheet. Your answers should be clearly numbered with the sub-question number then ruled off, so that the markers know which sub-question you are answering.

No. of questions	No. of sub-questions	Marks allocation
10	Maximum 03	10 per each question

TURN OVER

You are advised to spend no longer than 18 minutes on each question. Each question will carry 10 marks.

QUESTION 1

(a) A company has recently set up a mail-order operation to sell direct to the public. As an experiment, two different prices have been tried for a particular product, each for one week, with the following results:

Price per unit	Tk.7	Tk.9
Units sold per week	1050	950

Assuming that the relationship between price (P) and demand (D) is of the form $P = aD + b$, find the values of a and b. **(4 Marks)**

(b) The fixed costs of part of the mail-order operation are £2,000 per week. Variable costs of production are *£4* per unit plus insurance costs given by 2 per cent of the square of the quantity sold. Find an expression for total cost as a function of demand. **(3 Marks)**

(c) The following data is to be illustrated by means of a pie chart. Complete the table showing the value of the angles a, b, c and d that correspond to each category (to the nearest whole number):

Categories	%	Angle
A	8	a
B	43	b
C	37	c
D	12	d

(3 Marks)

QUESTION 2

(a) Suppose that in a senior college class of 500 students it is found that 210 smoke, 258 drink alcoholic beverages, 216 eat between meals, 122 smoke and drink alcoholic beverages, 83 eat between meals and drink alcoholic beverages, 97 smoke and eat between meals, and 52 engage in all three of these bad health practices. If a member of this senior class is selected at random, find the probability that the student

(i) Smokes but does not drink alcoholic beverages;
(ii) Eats between meals and drinks alcoholic beverages but does not smoke;
(iii) Neither smokes nor eats between meals.

(6 Marks)

(b) A shoe factory worth Tk.25,50,000 is ensured against fire. The probability of a fire occurring on the factory has been assessed at 3.9 in 1,000. If the insurance company is paid a premium of Tk. 7,000 per annum, then what is the expected value of the insurance policy to the insurance company? **(4 Marks)**

QUESTION 3

(a) According to personnel records, 111 employees of an accountancy practice can be classified by their work-base (A, B or C) and by their professional qualifications thus:

	Office A	Office B	Office C	Total
Qualified	26	29	24	79
Not qualified	11	9	11	31
Total	37	38	35	110

What is the probability that a randomly selected employee will:

(i) work at office A or office B?
(ii) work at office A or be professionally qualified or both?

(7 Marks)

TURN OVER

(b) Find the frequency density for the following distribution:

Time taken to complete repeated task (minutes)	Frequency
10–under 20	63
20–under 30	52
30–under 40	46
40–under 60	60
60–under 80	48
80–under 120	40

(3 Marks)

QUESTION 4

(a) Scores of two golfers for 6 rounds were as follows:

Golfer A	74	76	82	79	73	78
Golfer B	88	86	82	89	87	82

(i) Which golfer may be considered as a more consistent player?

(ii) Who is better golfer with respect to mean scores given above?

(6 Marks)

(b) Evaluate the following:

(i) $(81)^{3/4}$ (ii) $12+\frac{3-(6-8)}{(2+8-5)}$ - 2÷6 **(4 Marks)**

QUESTION 5

(a) A company is building a model in order to forecast total costs based on the level of output. The following data is available for last year:

Month	**Output '000 units**	**Costs £'000**
January	16	170
February	20	240
March	23	260
April	25	300
May	25	280
June	19	230
July	16	200
August	12	160
September	19	240
October	25	290
November	28	350
December	12	200

Evaluate Pearson's correlation coefficient for the above data on outputs and costs and interpret its value. **(7 Marks)**

(b) In a forecasting model based on $y = a\text{-}bx$, the intercept is £ 291. If the value of y is £491 and x is 20, then find the value of the slope. **(3 Marks)**

QUESTION 6

The quarterly sales of a product are monitored by a multiplicative time series model. The trend in sales is described by $Y = 100 + 4X$, where Y denotes sales volume and X denotes the quarterly time period.

The trend in sales for the most recent quarter (first quarter 2015, when $X = 20$) was180 units. The average seasonal variations for the product are as follows:

Quarter	First	Second	Third	Fourth
Seasonal effect	0	-20%	+40%	-20%

TURN OVER

The price of a unit was *Tk.*1,000 during the first quarter of 2015. This price is revised every quarter to allow for inflation, which is running at 2 per cent a quarter.

(i) Forecast the trend in the number of units sold for the remaining three quarters of 2015.
(ii) Forecast the actual number of units sold (to the nearest whole number) for the remaining three quarters of 2015.
(iii) Forecast the price per unit for the remaining quarters of 2015, giving your answers correct to nearest taka.
(iv) If the prior forecasts were as follows, forecast the sales revenue for the remaining quarters of 2015, giving your answers to the nearest taka.

Quarter of 2015	Forecasts price per unit (Tk.)	Numbers sold
2	150	1010
3	280	1030
4	155	1050

(10 Marks)

QUESTION 7

(a) A machine depreciates by 20 per cent in the first year, then by 10 per cent per annum for the next 5 years, and by 2 per cent per annum thereafter. Find its value to the nearest taka, after 7 years if its initial price is Tk.1,000,000. **(3 Marks)**

(b) A machine valued at Tk.500,000 depreciates at 6 per cent per annum. How many years will it take for its value to reduce to Tk.100,000? **(4 Marks)**

(c) If 50 people were asked whether they liked apples or oranges or both, 38 liked apples and 32 liked oranges. Use a Venn diagram to help you calculate how many people liked both? **(3 Marks)**

QUESTION 8

(a) Fit a straight line trend by the method of least squares to the following data:

Year	2008	2009	2010	2011	2012
Production of sheet	12	10	14	11	13

(4 Marks)

(b)

	A	B	C	D	E
1					
2					
3					
4		5	6	8	=B4/C4*D4
5		3	1	2	=(B5^D5)*2
6		9	7	2	=B6/3*C4
7		4	5	10	=(B6+C7)^D6
8		5	7	8	=B8/C7*D8-2
9		6	6		=(C9+4)^(B4-C5)

From the above spreadsheet find the values of E4, E5, E6, E7, E8, E9. **(6 Marks)**

QUESTION 9

(a) Solve: $\frac{1}{2}(4^x + 4^{-x}) = 2$ **(5 Marks)**

(b) Explain the benefits of Spreadsheet in business.

(5 Marks)

TURN OVER

QUESTION 10

(a) Calculate the NPV of a project having initial cash out-lay of Tk.50,000 and the cash in-flow during the next three years are Tk.30,000, Tk.10,000, Tk.20,000, given that the discount rate is 6% per annum. **(4 Marks)**

(b) The following table shows five items with their individual price indices and their relative weights. Calculate the weighted relative price index for the 5 items combined (give your answer to the nearest whole number).

Item	Price index	Weight
A	109	55
B	129	28
C	126	38
D	115	69
E	135	75

(6 Marks)

END OF QUESTION PAPER