

## Examiner's Report

AA1 EXAMINATION - JULY 2018

### (AA12) QUANTITATIVE METHODS FOR BUSINESS

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#### PART A

#### Question No. 01

##### General Matters:

- Candidates had not taken steps to pay attention to read the questions and the instructions regarding answering carefully. It was proved by their writing the full answers instead of the relevant numbers, and in certain instances by writing Roman figures not given in the question in place of the numbers given, in the case of question Nos. 1.1 to 1.10.
- Some candidates had provided answers to only a few parts instead of answering all the 15 parts of the question. The opportunity of obtaining full marks was lost by leaving blank spaces.
- Candidates in certain instances had cut off the first answer, the second answer and the third answer but had failed to provide other answers thereby foregoing marks as a result.
- Generally, due to lack of theoretical knowledge of candidates on simplification of equations, probability, compound interest, indices, standard deviation and normal distribution and their inability to arrive at the answers solving the problems correctly, incorrect answers seem to have been provided.
- The attention of candidates did not seem to have been received to the fact that 40% of the marks of the question paper had been allocated to this question. In order to pass the subject a large percentage of marks could have been obtained from this question and that the possibility of providing correct answers to a large number of parts during a short period of time, through short calculations was available to them. Candidates are therefore advised to devote around 01 hour to **Section A** out of the 03 hours allocated for the question paper, paying special attention to answer question No. 01.

These objective Test Questions consisted of 10 multiple choice questions and 5 short questions for a total of 40 marks. Although all formulae relevant to calculations had been provided with the question paper, some candidates had not selected the correct formulae. This was clear from the answers given by the candidates and through examining their workings. Some of the common weaknesses observed in the answers provided to sub-sections of this question are set out below:

- 1.1** Majority of the candidates had provided correct answers to this question in which the value of X could be obtained by solving an easy equation. Several instances where a few candidates had used  $6x + 4x$  instead of  $6x - 4x$  to arrive at the value of X had been observed. There were also instances where  $16 + 4$  had been used instead of as  $16 - 4$ . A few candidates had provided incorrect answers due to lack of basic practical knowledge in solving simple equations.
- 1.2** Although it was possible to arrive at the answers easily by using of two simple simultaneous equations, some candidates had not provided correct answers due to errors in construction and solving of simultaneous equations.
- 1.3** Majority of the candidates had provided satisfactory answers to this question which had tested the basic knowledge of probability. The reason for giving incorrect answers appraised to be not knowing the fact that the total of probability of each activity was equal to 1.
- 1.4** Majority of the candidates had answered correctly to this question relating to compound interest. Certain candidates had made mistakes in the process of calculating interest year by year and adding together instead of substituting values to the formula  $S = X(1 + r)^n$  to arrive at the answer. It was observed that some candidates had used the formula for simple interest and made incorrect calculations. Candidates should be knowledgeable to use calculators to obtain correct answers in this type of question.
- 1.5** Candidates who understood that the marginal cost function could be arrived by differentiation of total cost function, had selected the correct answer through that calculation. Some candidates who had no such knowledge had selected incorrect answers.
- 1.6** Some candidates did not know that the selling price of a product equals to cost + profit or loss. Some of them have computed only the profit as 20% of cost and had written incorrect answers without calculating the selling price. That is  $2,400 \times 20 / 100 = 480$  and stating given answer (1) as correct, they had in fact been incorrect.

- 1.7** Although the correct formula had been selected and correct substitution made to arrive at the correlation coefficient ( $r$ ), candidates appeared to have made mistakes in simplifications and the use of brackets, thereby providing wrong answers. More than half the number of candidates had substituted the value of  $\Sigma x^2$  instead of  $(\Sigma x)^2$  in substituting to the formula. What should have been done was selection of the relevant formula correctly from the formulae sheets; substitute the given data into it and arriving at the value of ( $r$ ). Candidates are required to engage in good practice of substituting of data to the formula and correct simplifications.
- 1.8** Some candidates had not correctly arrived at the index number for the year 2017, if the base year was changed to year 2014. They had arrived at incorrect answers by using  $\frac{130}{90} \times 90$  instead of  $\frac{130}{90} \times 100$ . But, a considerable number of candidates had provided correct answers to this question.
- 1.9** Finding out expected value of a discrete random variable was expected in this question. Out of the formulae given in the formulae sheet formula  $E(X) = \Sigma P \times X$  should be used in this case. Expected value was expected to be arrived at for this question for which comparatively a lesser number of candidates had attempted. But, some of the candidates had added up the probabilities and written down the answer as 1, which was incorrect.
- 1.10** Many candidates had not correctly understood this question. It was required to calculate the amount to be deposited at the end of each quarter for a deposit of Rs. 75,000/- at the end of 2 years. For that formula  $S = \frac{a(r^n - 1)}{r - 1}$  applicable to the sum of the first  $n$  terms of a Geometric Sequence should be used. The correct answer could be obtained by correct substitution and correct simplification. Most of the candidates had taken  $r = 0.12$  instead of  $r = \frac{0.12}{4} = 0.03$  and  $n=2$  instead of  $n = 2 \times 4 = 8$ . The candidates have not understood that it was the quarterly interest rate that should have been substituted.

The three questions 1.11 to 1.13 had tested the knowledge on calculation of simple interest and compound interest.

- 1.11** Most of the candidates had used the simple interest formula  $S = X(1 + nr)$  and correctly calculated in solving this problem. Some candidates had calculated the total of both principal and interest, but had not shown the interest separately. That is, without taking interest as  $272,000 - 200,000 = 72,000$ , and showing 272,000 as the final answer. It would be necessary to provide the answer by properly understanding the question.
- 1.12** Most of the candidates had solved this question correctly which related to how much would have been the interest if the loan had been on compounded interest. Some candidates could not score full marks because they failed to show the interest separately, deducting it from the principal amount. A considerable number of candidates had shown incorrectly as  $S = 200,000(1 + 0.12)^3$  when substituting the figures for  $S = X(1 + r)^n$ . Though Some candidates have substituted figures correctly to the formula, they had failed to arrive at the final answer by simplification. Although it was possible to obtain the interest for the 3 years through the formula at once, some

candidates had calculated separately for each year. Candidates should realize that in a question such as this, when number of simplifications increases the probability of errors will also increase.

- 1.13** Some candidates had no understanding that the formulae had to be used as  $S = x(1 + \frac{r}{4})^{n \times 4}$  when calculating interest on a quarterly basis.

Some had divided only the interest rate by 4 and some candidates had taken the interest rate as 0.12 and no of quarters as  $n \times 4$ . Though simplifications had been done with the use of calculators, carelessness and error in simplifications could be noticed.

- 1.14** Majority of the candidates had provided correct answers to this question which was set to test the basic knowledge on normal distribution. Candidates should understand that the most important parameters of the normal distribution are mean and standard deviation.

- 1.15** A considerable number of candidates had not provided correct answers to this question. It appeared that some candidates were not aware that at the profit maximization point, the total revenue is not equal to total cost. At the profit maximization point, marginal revenue is equal to marginal cost. Few candidates had not attempted for this question.

## **PART B**

The following matters were observed in the evaluation of answers of this section which consisted of 04 compulsory questions.

### **Question No. 02**

A significant number of candidates had provided correct answers to this question.

- (a) (i)** The following types of errors had been committed by candidates in answering this section.
- (1) Since it had been given that break-even point would be reached at 60 units, instead of simplifying the equation by substituting  $x = 60$ , some candidates have multiplied by 60 as  $(x^2 - 90x + 4,800) \times 60$  and as a result incorrect answers had been provided.
  - (2) Some candidates had provided incorrect answers by copying  $9x$ , instead of  $90x$  in the simplification as  $(60)^2 - 9(60) + 4,800$ .
  - (3) Certain others, in the simplification of the equation  $X^2 - 90x + 4,800$  (by substitution of  $X = 60$ ) values had been taken correctly as  $3,600 - 5,400 + 4,800$ . But in arriving at the final answer, they had calculated the total incorrectly as 13,800, disregarding the minus value.

- (ii) (1) Most of the candidates had calculated correctly the selling Price per unit at the break-even point.
- (2) Those candidates had understood that the total cost is equal to the total revenue at the break-even point, and accordingly in order to find out the selling price per unit, the total cost or total revenue at the break-even point had to be divided by the number of units.
- (3) Some candidates in simplifying  $\frac{3000}{60}$  had adopted very weak and incorrect calculations as  $\frac{3000}{60} = 5$  and  $\frac{3000}{60} = 500$ .
- (b) (i) (1) Majority of the candidates had correctly understood that the profit function is arrived at by deducting total cost function from the total revenue function.
- (2) Certain candidates in identifying profit function, instead of  $TR - TC$ , had incorrectly identified  $P = TC - TR$ .
- (3) Majority of the candidates had made mathematical mistakes in simplification of the  $TR - TC$  equation. Instead of writing correctly, using brackets, as  $36x - 4x^2 - (24x - 3x^2 + 1,200)$  they had incorrectly written as  $36x - 4x^2 - 24x - 3x^2 + 1,200$ . Even those candidates who used brackets had identified the profit function incorrectly because of not multiplying by the minus (-) sign.
- (ii) (1) Those candidates who have identified the profit function correctly, by differentiating and equating it to 0, had correctly calculated the quantity at which the profit is maximized.
- (2) Some other candidates had correctly found out the amount of profit maximization, by correctly equating marginal revenue of marginal cost. But, a considerable number of candidates had incorrectly used  $TR = TC$  instead of  $MR = MC$  in calculating the quantity at which the profit is maximized.

### Question No. 03

Majority of the candidates attempted this question and a considerable number of them were able to earn full marks. Weaknesses observed in the evaluation of answer scripts are stated below.

- (a) (i) (1) Though it was an easy tree diagram, certain candidates had not understood the relevant theory correctly.
- (2) Some candidates had drawn incomplete tree diagrams, and many candidates had drawn tree diagram incorrectly with three branches.

- (3) Some candidates had drawn two separate tree diagrams incorrectly instead of one tree diagram.
- (4) Certain candidates who had drawn the tree diagram correctly had marked its values incorrectly.

Eg: Stating the probability of starting a new project as  $\frac{0.8}{1.2}$  and the probability of not starting a new project as  $\frac{0.4}{1.2}$

- (5) Many candidates had no understanding that the total of probabilities of instances of probability and improbability are equal to 1. Therefore, in drawing tree diagrams total of probabilities in each of the branches, should be equal to 1 has skipped from the attention of certain candidates. Instances of this fact not being considered by them were observed.

- (ii) (1) Even some of the candidates who had correctly drawn the tree diagram, at (i) above, had made mistakes in simplifications in arriving at the probability.
- (2) In finding the probability of starting a new project, instead of  $(0.6 \times 0.8) + (0.4 \times 0.4)$ , some candidates have stated  $(0.6 + 0.8) + (0.4 + 0.4)$  erroneously.
- (3) Although some candidates had calculated the values of probabilities of the two groups separately correctly, they had failed to add up those two values.

Eg: stated only as—  $0.6 \times 0.8 = 0.48$   
 $0.4 \times 0.4 = 0.16$

(b) Two probabilities had to be calculated from the data given in the table of this question.

- (i) (1) It was possible to arrive at the answers directly from the use of probability theorem or by observation of the relevant probability table for this part.
- (2) Majority of the candidates had very easily understood this part and earned full marks.
- (3) A limited number of candidates had used wrong values such as 100 and 196 although the question had given 98 as the total.
- (4) A very limited number of candidates, instead of the probability of  $\frac{75}{98}$  had used  $\frac{98}{75}$ , changing the numerator and the denominator, for their calculations. It was observed that those candidates had not even understood the basic theory that probability cannot be more than 1.

- (ii) The correct answer to this part of the question had been calculated by the majority of candidates. In calculating the probability that the person failing the test is a female some candidates had added not only the females but also the males who failed, and an incorrect value of 23 had been obtained. That was the total number failed the driving test. Even through the correct answer to this part could be expressed from the table itself, a limited number of candidates had provided incorrect answers such as  $\frac{1}{15}$ .

## Question No. 04

This question also consisted of 02 parts for a total of 10 marks.

- (a) A table showing the amount of money spent annually on research activities and the annual income for the last six years of a biscuits manufacturing company had been provided. It was required to identify the regression line for the annual income using the least square regression given by  $y = a + bx$ .

Majority of the candidates had provided answers to this question in which the equation of the regression line had to be found. A considerable number of candidates had earned the full marks.

The following weaknesses were observed in the evaluation of answers for this question.

- (1) Some candidates had drawn graphs for this question. This indicated that answering had been done without reading through the question properly. Relevant formula for constants "a" and "b" had been provided, and correct substitution only had to be done.
  - (2) Even though values had been given, such as,  $\Sigma x = 30, \Sigma y = 180, \Sigma xy = 990$ , some candidates had copied the given values of X, Y in the form of a table, and re-calculated to obtain prior values, thereby wasting the allocated time. Here it appeared that candidates had not thought about the sum carefully, but tried to solve the problem mechanically in the same manner as they had got used to.
  - (3) In arriving at the value of 'b', some candidates had written the formula for correlation coefficient and erroneously had taken the value of r as b.
  - (4) In arriving at the value of 'b', instances of mixing up  $\Sigma xy$  and  $\Sigma x, \Sigma y$ , in substituting of values had been observed.
  - (5) Although the value of 'n' was 6, some candidates had taken other values and had gone wrong in their answers.
  - (6) Some candidates, who substituted values to formula correctly, had made mistakes in simplification.
  - (7) Even those candidates who had taken the value of 'b' correctly, had not taken correctly the value of  $\bar{x}$  and  $\bar{y}$  as  $\frac{\Sigma x}{n}$  and  $\frac{\Sigma y}{n}$ . As such, they were not able to arrive at the value of a.
  - (8) Even some candidates who had correctly arrived at values of "a" and "b" had not substituted to the formula  $y = a + bx$  and not identified the equation of the regression line.
- (b) Although it was possible to arrive at the answers to this part easily by using the equation of the regression line of part (a), some candidates failed to arrive at the value of y, by substituting 7 for x of the formula  $y = 18.75 + 2.25x$ . There were instances where very simple additions and subtractions had been done incorrectly while the facility of use of calculators was made available to candidates.

## Question No. 05

**Part (a)** of this question required calculation of the Mean and Standard Deviation from the given data and **part (b)** required calculation of moving averages from data in the given table. Majority of the candidates had obtained high marks for **part (a)** and obtaining of marks for **part (b)** had been at a low level. The following weaknesses had been observed in the evaluation of answers scripts:

### Part (a) (i)

- (1) Though calculation of the mean in part (i) had been easily done, there were instances in which candidates were failed in arriving at the standard deviation in part (a) (ii).
- (2) Due to not taking the total of data correctly in calculating the mean, the value of  $\Sigma x$  had been taken incorrectly. Also some candidates had taken incorrect values for 'n' instead of 7.

### Part (a) (ii)

- (1) Errors in calculations had been made in arriving at  $\sum (\bar{x} - x)^2$  or  $\Sigma x^2$
- (2) Some candidates forgetting the symbol  $\sqrt{\quad}$  of the formula in simplification downwards had blundered in the standard deviation.
- (3) Some candidates had not understood the difference between  $(\Sigma x)^2$  and  $\Sigma x^2$
- (4) Some candidates had calculated the variance instead of standard deviation.

### Part (b)

- (1) Some candidates had calculated moving totals instead of moving averages. They had not divided it by four (04) and had not taken the correct values.
- (2) Further, even though it was possible to understand correctly how moving averages were calculated, because the question had given one moving average value as an example, candidates had provided incorrect answers because of mixing up the quarterly sales incorrectly.

A considerable number of candidates giving up answering of the part relating to moving average (time) needs special consideration. The reason would have been not studying this subject area. It is therefore imperative that those candidates should study all sections of the syllabus before the examination.



## PART C

Marks earned by candidates in providing answers to each of the parts of this section had been reduced because of the following errors and shortcomings.

### **Question No. 06**

#### Part A

This part tested presentation of data in statistics and required to calculate the sales revenue from each product in degrees using the given data to draw a pie chart.

- (1) Majority of the candidates have earned the full marks allocated to this section. Those who had to forego marks had blundered in the number of degrees in each proportion, by taking incorrect values of 180, 175 million instead of 170 million as addition of sales revenue.
- (2) Although it was necessary to calculate the value of each proportion and multiply that by  $360^{\circ}$ , candidates had multiplied by 100 instead of by 360.
- (3) Though it was stated in the question that drawing of the chart was not necessary, some candidates had devoted time and drawn it.

#### Part B

The selling prices and quantities of 3 items had been provided to calculate the base weighted aggregate price index (Laspeyre's price index) for the year 2017. The objective of the question was arriving at the answer by identifying the correct formula from the formulae list given with the question paper, and substitution there to correctly calculated values.

Candidates had committed the following errors:

- (1) Some candidates had copied incorrectly the Laspeyre's Price Index which is  $\frac{\sum P_1 q_0}{\sum P_0 q_0} \times 100$ .
- (2) Some candidates had committed multiplication and mathematical errors in arriving at  $\sum p_1 q_0$  and  $\sum p_0 q_0$
- (3) Some candidates had copied the formula applicable to Laspeyre's quantity index instead of the formulae of Laspeyre's price index.
- (4) In arriving at  $\sum p_1 q_0$  and  $\sum p_0 q_0$ , some candidates had taken those erroneously as  $\sum p_1 \times \sum q_0$  and  $\sum p_0 \times \sum q_0$ .
- (5) There were also instances where instead of taking item mix, each item had been separately taken by a limited number of candidates.
- (6) Some candidates had shown Laspayre's Price Index as  $\frac{\sum P_1 q_0}{\sum P_0 q_0}$  without multiplying by 100.

- (C) Calculating the values of X and Y by solving two simple simultaneous equations was expected as the answer. A considerable number of candidates had earned maximum marks. But, the following shortcomings were noted in the evaluation process.

Some candidates, by not using brackets correctly, when one equation is subtracted from another, due to change of symbols “+” and “-”, have blundered in the values.

Eg: As  $4x + 10y - 4x + 2y = 120 - 40$ . Many candidates had taken as  $y = \frac{80}{12}$  erroneous answers.

- (D) It was expected to compute the Net Present Value of a 03 year project, in consideration of cash flows of an initial investment of Rs. 500,000/-. About half of the number of candidates had arrived at correct answers. Those who did not earn maximum marks had committed errors, and their weaknesses are set out below.

- (1) Instead of deducting the initial investment, it had been added on to the discounted value of cash flows.
- (2) Some candidates had erroneously calculated the 10% discounting factor. Certain candidates had used other discounting factors.
- (3) Without taking 1 as the discounting factor of the starting year of the initial investment, the initial investment had been multiplied by 0.909 as the first year discounting factor. Candidates have to understand that the year of the initial investment has to be ‘year 0’ and the discounting factor has to be taken as 1.
- (4) A limited number of candidates had not multiplied the cash flows by the discounting factor and had calculated erroneously.

Eg.  $150,000 + 220,000 + 260,000 = 630,000$

$$\text{NPV} = 630,000 - 500,000 = 130,000$$

- (4) Some candidates had added on the cash flow of Rs.150,000/- of the first year to the cash flow of the second year as Rs.370,000/-, multiplied by the discounting factor and obtained incorrect answers.
- (5) Some candidates had not provided answers to Part (ii). Even though a (+) net present value had been calculated, incorrect answers that the company should not invest in the project had been written by some of the candidates. This displays lack of understanding of project evaluation.

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**General matters for which attention should be drawn to improve performance level of candidates:**

1. Studying well the full contents of the new syllabus completely paying more attention to newly introduced subject matters.
2. Workings should be clearly shown along with answers wherever applicable.
3. Care should be exercised in copying formulae and in substitution. Using of the most convenient formula when several formulae could be applied to answer certain questions.
4. Handwriting should be legible and the numbers of questions should be correctly written.
5. Following correctly the instructions given in the question paper.
6. Perusal of past question papers and suggested answers would help sharpening of knowledge and experience.
7. Proper management of time is important.
8. Re-checking of question numbers etc. before handing over answer scripts is a must.
9. Appearing for the examination with a firm determination of passing the examination with due preparation.

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