



Quantitative Methods

Foundation Examination
Spring 2012
Module A

6 March 2012
100 marks - 3 hours
Additional reading time - 15 minutes

- Q.1 (a) Factorize $f(x)$ by completing the square where:
 $f(x) = x^4 - 2x^2y^2 - 8y^4$
Find the possible value of x , where $f(x) = 0$ and $y = 5$ (05 marks)
- (b) Find the sum of all integers between 170 and 1000 which are exactly divisible by 8. (05 marks)
- (c) Solve the following equation:
 $(2e^{5x} + 5e^x)(2e^{2x} - 11) = -55e^x$ (06 marks)
- Q.2 (a) Ali would require a sum of Rs. 300,000 after three years from now and a sum of Rs. 500,000 after five years from now, for the purpose of education of his son. He is planning to deposit quarterly amounts in an investment scheme to get the desired amounts at the required time. If the rate of interest is 12% compounded quarterly, what amount should Ali deposit at the start of each quarter? (05 marks)
- (b) Hayyan invested an amount of Rs. 400,000 in an investment scheme and got Rs. 545,881 at the end of three years. Find:
- (i) The effective annual rate of interest if interest was compounded monthly.
(ii) The nominal rate if interest was compounded quarterly. (06 marks)
- Q.3 (a) Find dy/dx where $y = \frac{(x+3)(x-2)}{\sqrt{x}}$ (05 marks)
- (b) The demand function for a firm's product is $q = 150,000 - 75p$ where q equals the number of units demanded and p equals the price in rupees.
- (i) Determine the price which should be charged to maximize total revenue.
(ii) What is the maximum revenue that the firm can earn?
(iii) How many units are expected to be demanded when the firm is earning maximum revenue? (07 marks)
- Q.4 (a) Sketch the feasible region and identify the redundant constraints from the following set of inequalities:
- (i) $x + y \leq 6$ (ii) $5x + 3y \leq 15$ (iii) $x \leq 2$ (iv) $x, y \geq 0$ (07 marks)
- (b) If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}$
- Prove that B is an inverse of A. (04 marks)
- Q.5 Company A and B are cement manufactures. The quantity of cement in bags produced by company A has a mean of 50 kg and standard deviation of 0.24 kg, while quantity in bags of company B has a mean of 49.8 kg and standard deviation of 0.75 kg.
- If random samples of 30 bags from each company are taken, find the probability that the difference between means of the two samples is more than 0.25 kg. (07 marks)

- Q.6 The following table shows the actual monthly wages and the real wages of a worker over the previous years:

Year	2005	2006	2007	2008	2009	2010
Wages (Rs.)	11,000	12,000	13,500	14,800	16,500	19,000
Real Wages (Rs.)	11,000	10,800	11,300	11,100	10,550	10,900

- (a) Compute the price index for the years 2006 to 2010, rounded to one decimal place, taking 2005 as the base year. (3.5 marks)
- (b) If the price index for the year 2011 is 191.2, calculate the amount of wages whose buying power would be the same as that of the year 2007? (1.5 marks)

- Q.7 Following table shows the runs scored by a batsman in limited over matches during a calendar year:

Range of Runs (x)	0 – 09	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89
Number of Matches (f)	1	0	1	4	4	10	7	2	1

- (a) Draw a histogram based on the above frequency distribution. (03 marks)
- (b) Compute the inter-quartile range for the above distribution. (05 marks)

- Q.8 Given below is a set of data for two variables:

x	31	45	63	53	56	43
y	10	16	18	20	19	16

- (a) Determine the regression line for x on y . (06 marks)
- (b) Find the coefficient of correlation and interpret the result. (04 marks)
- (c) Identify the point where the regression line for x on y will intersect the regression line for y on x . (01 mark)

- Q.9 The following table shows the number of courses being taken by 100 students in a college:

Number of Courses	Frequency
4	20
5	50
6	30

- (a) Construct a probability distribution table for the number of courses taken by a student picked up at random from among the above 100 students. (02 marks)
- (b) If forty students are selected at random, with replacement, find the probability that the mean number of courses being taken by them is more than 5.3. (06 marks)
- (c) If two students are selected at random, with replacement, find the probability that the mean number of courses being taken by them is less than 4.7. (03 marks)

- Q.10 (a) During safety and security drive of the Health Department, 190 private hospitals of a large city were surveyed. It was found that 79 hospitals were in violation of sanitary standards, 86 were in violation of security standards and 58 were in violation of both. If a private hospital is chosen at random, find the probability that it is in compliance with:

- (i) sanitary standards but not with security standards.
- (ii) both security and sanitary standards. (04 marks)

- (b) A bag contains four red balls, three green balls, one blue ball and one yellow ball. Two balls are drawn out from the bag at random, without replacement. Find the probability that:

- (i) both the balls are of the same colour.
- (ii) both are of different colour.
- (iii) at least one ball is green. (04 marks)

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