The Institute of Chartered Accountants of Pakistan

Quantitative Methods

Foundation Examination
Spring 2013
Module A

5 March 2013
100 marks - 3 hours
Additional reading time - 15 minutes

Q.1 (a) A car was moving at a speed of 135 km per hour. When brakes were applied, the speed of the car reduced to 43.2 km per hour in five seconds. Find the rate of decline in the speed of the car per second, if the percentage decrease after each second was the same. **(03)**

(b) Find the value of x:
(i) $$\frac{(x+3)}{(x-2)} - \frac{8}{3} = \frac{(x+2)}{(x-1)}$$ (ii) $e^{2x} - 1 = 0$ **(07)**

Q.2 (a) The difference between simple and compound interest on a certain amount of money for 8 years at 14% per annum is Rs. 12,500. Find the amount. **(03)**

(b) Ali paid Rs. 34,434 per month for three years to pay back a bank loan. Calculate the amount borrowed by Ali and interest paid thereon, if interest was charged at the rate of 14.5% per annum on the outstanding amount, on a monthly basis. **(05)**

(c) The cost of wood used by a furniture manufacturer for making a table amounts to Rs. 7,000. Other costs incurred by him amount to 30% of the cost of wood. What price shall he charge, if he wishes to earn a profit of 12.5% of the selling price? **(03)**

Q.3 (a) If $y = (x^2 - 1)^4(x^2 + 1)^5$, show that:

$$\frac{dy}{dx} = 2x\,(x^2 - 1)^3(x^2 + 1)^4\,(9x^2 - 1)$$ **(05)**

(b) At selling price of Rs. 38 per unit, monthly sale of a product is estimated at 10,200 units. However, if selling price is increased by Rs. 9 per unit, it is expected that monthly sale would reduce to 8,400 units. The total cost function of the product is:

$$C(x) = 15,000 + 18x, \text{ where } x \text{ is the number of units.}$$

(i) Determine the price function, assuming it is linear.
(ii) Calculate the maximum monthly profit that can be earned. **(08)**

Q.4 (a) Solve the following system of equations by using matrix inversion method:

(i) $x + y - z = 2$ (ii) $2x - y + 3z = 17$ (iii) $3x + 2y - 4z = -3$ **(10)**

(b) For the following set of inequalities, draw the graph and highlight the feasible region clearly indicating its boundaries:

(i) $x + y \geq 7$ (ii) $2x + y \geq 10$ (iii) $x + y \leq 8$ (iv) $x, y \geq 0$ **(06)**

Q.5 (a) Age distribution of employees in Young Corporation is as follows:

Age in years	22-26	26-30	30-34	34-38	38-42	42-46	46-50
No. of employees	6	10	8	5	7	1	3

Find coefficient of variation of age of employees. **(06)**

(b)   Following data has been gathered from a survey:

Commodity	Price (Rs.)			Quantity (kg)	
	2010	2011	2012	2010	2011
Alpha	64	75	80	270	276
Beta	40	45	41	124	118
Gamma	18	21	20	130	121
Eta	58	68	56	185	267

(i)   Calculate Fisher's Price Index for the year 2011.
(ii)   If Fisher's Price Index for the year 2012 is 110.7, calculate the Paasche's Price Index for the year 2012, taking 2010 as base year.   **(07)**

Q.6   In an effort to reduce crimes, the Superintendent Police of Far Town has requested the Inspector General to increase police strength in his town. He has gathered information from other towns of the city and submitted the following details to support his request:

Towns	Bee	Cee	Dee	Gee	Jay	Kay	Pee	Tee
Police Strength	150	170	250	270	170	120	110	220
No. of Crimes per month	170	110	50	40	90	210	188	60

(a)   Determine the regression equation and interpret your result. (Assuming that ratio of police strength to total number of people is same in all towns)
(b)   Determine the coefficient of correlation and determination and interpret your results.
(c)   Using the above regression equation, determine whether police of Jay town is more efficient than police of Pee town.   **(13)**

Q.7   (a)   A multiple choice examination consists of ten questions and each question is followed by four choices. A student will pass the exam if he answers five questions correctly. Assuming that a student knows two correct answers and chooses the remaining answers at random, what is the probability that he will pass the test?   **(05)**

(b)   In a population, which is normally distributed, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the population.   **(05)**

Q.8   (a)   A Production House has carried out a survey to assess the popularity of one of its programs. A random sample of 2,000 people was selected and they were asked to give their views. The results are as follows:

Opinion	Number of persons
Like the program	1,040
Do not like the program	650
Do not know	310

(i)   Construct a 97% confidence interval for the proportion of viewers who like the program.
(ii)   Based on the interval constructed by you in part (i), can you say with 97% confidence that majority of the viewers like the program. Would your decision change if the required confidence level is 92%?   **(08)**

(b)   A television (TV) manufacturer claims that the mean life of the picture tubes of its classic TV brand is 8,000 hours. A random sample of 18 picture tubes showed a mean life of 7,850 hours with a standard deviation of 150 hours. Test the manufacturer's claim using a significance level of 0.01.   **(06)**

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