

INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF PAKISTAN



Fall (Winter) 2008 Examinations

Saturday, the 22nd November 2008

BUSINESS MATHEMATICS & STATISTICS – (S-203)

Stage-2

Time Allowed – 2 Hours 45 Minutes

Maximum Marks – 80

- (i) Attempt ALL questions.
- (ii) Answers must be neat, relevant and brief.
- (iii) In marking the question paper, the examiners take into account clarity of exposition, logic of arguments, effective presentation, language and use of clear diagram / chart, where appropriate.
- (iv) Read the instructions printed on the top cover of answer script CAREFULLY before attempting the paper.
- (v) Use of non-programmable scientific calculators of any model is allowed.
- (vi) DO NOT write your Name, Reg. No. or Roll No. anywhere inside the answer script.
- (vii) Question No.1 – “Multiple Choice Question” printed separately, is an integral part of this question paper.

SECTION - A

Marks

Q. 2 (a) The number of women in a labour force is expected to increase in 2009, but not as dramatically as during 1990's. One of the forecasting consultants uses the linear equation $n = 30.5 + 1.5t$ to predict the number of women between the ages of 25 and 34, who will be in the labour force. Where n equals number of women (measured in millions) and t is the time (measured in years), since 2001 ($t=0$ corresponds to 2001). If n is plotted on vertical axis:

Required:

- (i) Graph the equation. 03
 - (ii) Identify the slope and y-intercept (n -intercept, here). 02
 - (iii) Interpret the meaning of slope and n -intercept in this equation. 03
- (b)** Determine the equation of the quadratic function, which passes through the points $(1, -1)$, $(-3, -33)$ and $(2, -8)$. 04

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- (c) In manufacturing a product, a firm incurs costs of two types. Fixed annual costs of Rs.250,000 are incurred regardless of the number of units produced. In addition, the cost of each unit produced is Rs.6. If C equals total annual cost, in rupees, and x the number of units produced during a year:

Required:

- (i) Determine the function $C = f(x)$, which expresses the annual cost. 02
- (ii) What is $f(200,000)$? What does $f(200,000)$ represents? 03
- (iii) State the restricted domain and restricted range of the function, if maximum production capacity is 300,000 units per year. 03

- Q. 3 (a)** The cost of selling a product is $c = x^2 - 2x + 20$, where:
 x = output in batches
 c = cost in thousands of rupees

The revenue from the product is $r = 8.5x^2 - x^3 + 20x$, where:
 r = value in thousands of rupees
 x = sales in batches

Required:

- (i) At what volume of output, cost would be minimized? 03
 - (ii) At what volume of sales would total revenue be maximized? 04
 - (iii) Using the principle that profits are maximized, when marginal cost equals marginal revenue ($MC=MR$), calculate the volume of output and sales, which will maximize the profits. 03
- (b) An investment of Rs.15,000, invested for a period of 6 years, accumulates to a sum of Rs.24,000. Calculate the rate of interest when compounded half yearly. (Note: $(1.6)^{1/12} = 1.03994$) 04

- (c) Evaluate the following integrals:

(i) $\int_2^3 \frac{x^2}{x^3 - 1} dx$ 03

(ii) $\int \frac{x}{\sqrt{x^2 - 8}} dx$ 03

(Note: $\ln 26=3.258$ and $\ln 7=1.946$)

SECTION - B

Marks

Q. 4 The frequency distribution of a group of persons according to their ages is given below:

Age in years	<1	1 – 4	5 – 9	10 – 19	20 – 29	30 – 39	40 – 59	60 – 79
No. of persons	5	10	11	12	22	18	8	7

Required:

Calculate:

- (a) Mean age and
(b) Median age

05
05

Q. 5 (a) One bag contains 4 white and 3 black balls, and a second bag contains 3 white and 5 black balls. One ball is drawn from first bag and placed in the second bag. What is the probability that a ball now drawn, from the second bag, is black?

04

(b) A study was made by a retail merchant to determine the relation between weekly advertising expenditure and sales. The following data was recorded:

Advertising cost (Rs.)	40	20	25	20	30	50	40	55	45
Sales (Rs.)	385	400	395	365	475	440	490	565	515

Required:

- (i) Find the equation of the regression line.
(ii) Graph the line on the scatter diagram.
(iii) Estimate the weekly sales, when advertising costs are Rs.500.

03
02
01

SECTION - C

Q. 6 (a) Define the following:

- (i) Floats
(ii) Total and
(iii) Free floats

02
01
01

(b) A project has the following activities:

Activity	Immediate Predecessors	Duration (in days)
A	—	4
B	—	7
C	A	3
D	A	3
E	B	2
F	B	2
G	D, E	2
H	F, G	3

Required:

- (i) Draw the project network.
(ii) Find the critical path.
(iii) Total duration of the project.

02
02
02

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Q. 7 A firm manufactures two products. Each product must be processed through three departments as under:

- Product A requires 4 hours per unit in department I, 3 hours per unit in department II and 1 hour per unit in department III.
- Product B requires 2 hours per unit in department I, 6 hours per unit in department II and 1 hour per unit in department III.
- The departments I, II and III have 160, 300 and 150 hours available each week respectively.
- Profit margins for the two products are Rs.15 and Rs.10 per unit respectively.
- x_j equals the number of units produced of product j .

Required:

- (a) Formulate the linear programming model, which maximizes the total profit. 04
- (b) Solve the above using Simplex Method. 06

THE END