INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF PAKISTAN

Fall (Winter) 2009 Examinations

Monday, the 16th November 2009

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)** Solve the following system of equations by Gaussian Elimination Method:

$$\begin{aligned} x + 2y &= 5 \\ x - z &= -15 \\ -x + 3y + 2z &= 40 \end{aligned}$$

08

(b) Solve the equation $4x^2 + 18x - 10 = 0$ by factorization. 04

(c) Find the equation of the straight line, which passes through the point of intersection of the lines $2x + 4y = 20$ and $3x + y = 10$ and is perpendicular to the line $5x - 2y = 20$. 08

Q. 3 **(a)** Find the derivative of the following function:

$$f(x) = e^{2x+5}(4x^2 - 5x + 4)^4$$ 04

(b) A company specializing in a mail-order sales approach is beginning a promotional campaign. Advertising expenditure will cost the firm Rs.5,950 per day. Specialists estimate that the rate at which profit (exclusive of advertising costs) will be generated from the promotion campaign decreases over the length of the campaign. Specifically, the rate **r(t)** for this campaign is estimated by the function:

$$\mathbf{r(t) = -50\,t^2 + 10{,}000}$$

Where '**t**' represents the day of the campaign and **r(t)** is measured in rupees per day. In order to maximize the net profit, the firm should conduct the campaign as long as **r(t)** exceeds the daily expenditure cost.

Required:

(i) How long should the campaign be conducted to achieve the above objective? 03
(ii) What are the total advertising expenditures expected to equal during the campaign? 02
(iii) What will be the expected net profit? 03

(c) The nominal interest rate of investment is 14% per year. Determine the effective interest rate, if interest is compounded bi-monthly. 02

(d) Suppose a dropped ball always rebounds one-half the height it falls. If it is dropped from a height of 64 meters, how far will have it traveled when it reaches the top of the fifth bounce? 06

PTO

SECTION "B"

Marks

Q. 4 (a) The income distribution of 100 families is given below:

Income	0 – 25	25 – 50	50 – 75	75 - 100	100 - 125	125-150
No. of families	18	-	25	-	14	18

Mode of the given distribution is 60. Find out the missing frequencies? 05

(b) Find Fisher's Ideal index number of the year 2005 for the following data: 05

Commodity	**Price (Rs.)**		**Qty (units)**	
	Year 2000	**Year 2005**	**Year 2000**	**Year 2005**
A	12.50	15.00	125	150
B	30.00	40.00	160	185
C	75.00	85.10	140	165
D	95.15	105.00	78	85
E	125.00	140.00	65	50
F	155.10	170.35	45	63

Q. 5 Random samples of size two are drawn from the finite population 2, 4, 6 and 8 with replacement.

(a) Construct sampling distribution of mean. 04

(b) Verify that 06

$\mu x = \mu$ and $\sigma x = \sigma / \sqrt{n}$

SECTION "C"

Q. 6 A particular project comprises 12 activities, which have the following durations and preceding activities:

Activity	**Duration (days)**	**Immediately preceding activities**
A	3	-
B	5	A
C	7	L
D	2	L
E	9	-
F	6	B, C
G	5	E
H	6	B, C
I	3	A
J	4	I
K	4	D, F
L	4	-

Required:

(a) Represent the project by means of a network diagram. 05

(b) Show the earliest and latest times for each activity. 04

(c) Determine the critical path and minimum completion time of the project. 01

Q. 7 Solve the following linear programming model by using simplex method. 10

$$\begin{aligned} \text{Maximize} \quad & z = 10x + 12y \\ \text{Subject to} \quad & x + y \leq 150 \\ & 3x + 6y \leq 300 \\ & 4x + 2y \leq 160 \\ & x, \; y \geq 0 \end{aligned}$$

THE END