INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF PAKISTAN

Spring (Summer) 2010 Examinations

Tuesday, the 25th May 2010

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 inside 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) There is a linear relationship between the market price of a particular commodity and the number of units, suppliers of the commodity are willing to bring to the market place. Two samples observations indicate that when the price equals Rs.150 per unit, the weekly supply equals 30,000 units, and when the price equals Rs.200 per unit, the supply equals 50,000 units.

Required:

(i) If price per unit 'p', is plotted on the horizontal axis and the quantity supplied 'q' is plotted on the vertical axis, determine the slope-intercept form of the equation of the line (in the form of 'p' and 'q') which passes through these two points. 04

(ii) Interpret the meaning of slope in this application. 02

(iii) Predict the weekly supply if the market price is Rs.250. 02

(b) An individual invests Rs.50,000 in a money market fund which is expected to yield interest at a rate of 12 percent per year compounded quarterly. If the interest remain stable to what amount should Rs.50,000 grow over the next 5 years? How much interest should be earned during this period? 06

(c) Find the inverse of the following matrix: 06

$$A = \begin{bmatrix} 0 & 3 & 1 \\ 1 & 1 & 0 \\ 2 & 3 & 3 \end{bmatrix}$$

Q. 3 (a) The function V = f(t) = 36,000 - 4,500t states that the value of a piece of equipment is a function of its age. 'V' equals the value (in rupees) and 't' equals the age of the equipment (in years). Determine the restricted domain and range for this function. 06

(b) Solve the equation x + 1/x = 1/2 06

(c) Determine the following Indefinite Integral:

$$\int (3x-1)(3x^2-2x+4)^4\,dx$$ 04

PTO

Marks

(d) Find the derivative of the following function:

$$f(x) = \frac{6x^2 + 3x - 5}{\ln (5x + 4)}$$ 04

SECTION "B"

Q. 4 (a) According to a study, the relation between weekly advertising expenditure and sales was recorded as given below:

Advertising cost (Rs.)	48	22	25	20	30	50	40	55	45
Sales (Rs.)	380	420	395	365	475	440	490	565	515

Required:

(i) Find the equation of the Regression Line. 05

(ii) Predict the sale if advertising expenditure is Rs.60. 01

(b) The probability that an automobile being filled with gasoline will also need an oil change is 0.35; the probability that it needs a new oil filter is 0.50 and the probability that both oil and filter need changing is 0.18.

Required:

(i) If the oil has to be changed, what is the probability that a new oil filter is needed? 02

(ii) If a new oil filter is needed, what is the probability that the oil has to be changed? 02

Q. 5 (a) The probability that a patient recovers from a delicate heart operation is 0.9. Four patients have this operation. What is the probability of surviving of:

(i) at most 2 patients? 03

(ii) at least 2 patients? 02

(b) The contents of seven similar containers of sulphuric acid are 9.5, 10.3, 10.2, 9.9, 10.1, 10.0, and 9.5 liters. Find a 99% confidence interval for the mean contents of all such containers, assuming an approximate normal distribution for container contents. 05

SECTION "C"

Q. 6 A small project comprises seven activities whose time estimates are listed in the table below:

Activity	**1 – 2**	**1 – 3**	**1 – 4**	**2 – 5**	**3 – 5**	**4 – 6**	**5 – 6**
Optimistic time estimate	1	1	2	1	2	2	3
Most likely time estimate	1	4	2	1	5	5	6
Pessimistic time estimate	7	7	8	1	14	8	15

Here, t_0= most optimistic, t_m = most likely and t_p= most pessimistic times for each activity.

Marks

Required:

Calculate:

(i) The expected duration t_e, and variance of each activity. 04

(ii) Draw the project network and identify all the paths through it. 03

(iii) What is the expected project length? 01

(iv) If the project due date is 18 weeks, what is the probability of not meeting the due date? 02

Q. 7 A chemical company uses three chemicals A, B and C, in one of its processes. It obtains these by buying in two minerals 1 and 2. The minimum daily requirements of the chemicals are 24, 24 and 21 tones respectively. The amounts of each chemical present in the two minerals are (percentage by weight) are here under:

Chemical	Minerals 1	Minerals 2
A	8	3
B	6	4
C	3	7

Required:

(a) Formulate the Linear Programming Model which minimizes the total cost. 04

(b) Determine the optimal daily amount of each mineral which the company should buy, by the Corner Point Method if cost of minerals 1 and 2 are Rs.1,200/tonne and Rs.1,500/tonne respectively. 06

THE END

TABLES

Binomial Probability Sums $= \sum_{n=0}^{r} b(x;n,p)$

n	r	0.50	0.60	0.70	0.80	0.90
4	0	0.0625	0.0256	0.0081	0.0016	0.0001
4	1	0.3125	0.1792	0.0837	0.0272	0.0037
4	2	0.6875	0.5248	0.3483	0.1808	0.0523
4	3	0.9375	0.8704	0.7599	0.5904	0.3439
4	4	1.0000	1.0000	1.0000	1.0000	1.0000

Critical Values of "t" Distribution

ν	α				
	0.10	0.05	0.025	0.01	0.005
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169

Standard Normal Probability Table

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879