INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF PAKISTAN

Spring (Summer) 2009 Examinations

Monday, the 25th May 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.

Marks

SECTION - A

Q. 2 **(a)** Solve the following equations by inverse of matrix method:

$4x + 5y = 23$

$3x + 2y = 12$ 05

(b) A firm sells two products. The annual total revenue R behaves as a function of the number of units sold. Specifically:

$R = 400x – 4x^2 + 1960y – 8\,y^2$

Where x and y equal, respectively, the number of units sold of each product.
The cost of producing the two products is:

$C = 100 + 2x^2 + 4\,y^2 + 2xy$

Required:

Determine the number of units, which should be produced and sold in order to maximize the annual profit. 05

(c) A firm sells a product for Rs.45 per unit. Variable cost per unit is Rs.33 and fixed cost equals Rs.450,000. How many units must be sold in order to breakeven? 04

(d) (i) Find 20^{th} term of the series 1, 3, 5, 7, 9, …… 02

(ii) What will be the sum of 20 terms in (i) above? 02

(e) Resolve the following into partial fraction:

$$\frac{7x – 19}{(x – 2)(x – 3)}$$ 02

PTO

Marks

Q. 3 **(a)** The function describing the marginal cost (in rupees) of producing a product is:

$$MC = 8x + 800$$

Where x equals the number of units produced. It is known that total cost equals Rs.80,000, when 40 units are produced. Determine the total cost function. 05

(b) Determine the derivative of $f(x) = 5x^2 - 3x + 5$ by using limit approach method. 05

(c) Determine the monthly car payment necessary to repay a Rs.300,000 car loan, if the interest is 18% per year compounded monthly. Assume the period of loan is 5 years. Find the amount of interest. 08
(Note: $1.015^{60} = 2.44322$)

(d) Find the mid-point of the line segment connecting the points (2, 4) and (–3, 6). 02

SECTION - B

Q. 4 **(a)** The mean and variance of 5 observations are 7.4 and 12.64, respectively. If 3 of the 5 observations are 2, 8 and 12, find the remaining two observations. 05

(b) The grades of a class of 9 students on a midterm report (x) and on a final examination (y) are as follows:

x	40	20	25	20	30	50	40	55	45
y	85	40	95	65	75	44	49	65	55

Required:

(i) Compute and interpret coefficient of correlation. 04

(ii) Compute and interpret coefficient of determination. 01

Q. 5 **(a)** A class has 20 boys and 16 girls, of which, half the boys and half the girls are fat. Find the probability that a student chosen, at random, is:

(i) either a boy or a fat student. 2.5

(ii) either a girl or a fat student. 2.5

(b) The weights of a large number of miniature poodles are approximately normally distributed with a mean of 8 kilograms and standard deviation of 0.9 kilogram. If measurements are recorded to the nearest tenth of a kilogram, find the fraction of these poodles with weights between 7.1 and 9.2 kilograms inclusive. 05

SECTION – C

Q. 6 **(a)** Calculate the cost slopes and the critical path of the following network: 05

Activity	Preceding Activity	Time		Cost (Rs.)	
		Normal	Crash	Normal	Crash
1	–	6	4	5,000	6,200
2	–	4	2	3,000	3,900
3	1	7	6	6,500	6,800
4	1	3	2	4,000	4,500
5	2, 3	5	3	8,500	10,000

(b) Construct a least cost schedule for the network in part (a) showing all durations from normal time – normal cost to crash time – crash cost. 05

Marks

Q. 7 The dietitian at a local penal institution is preparing the menu for tonight's light meal. Two food items will be served at the meal. The dietitian is concerned about achieving the minimum daily requirement of two vitamins.

Food 1 contains 1 mg/oz vitamin-1 and 2 mg/oz vitamin-2.

Food 2 contains 1 mg/oz vitamin-1 and 4 mg/oz vitamin-2.

Minimum daily requirement of vitamins-1 and vitamins-2 are 10mg and 24mg respectively. Cost per ounce for the two foods are Rs.5 and Rs.6, respectively. If x_j equals the number of ounces of food j, then:

(a) formulate the linear programming model for determining the quantities of the two foods, which minimize the total cost of the meal while ensuring that at least minimum levels of both vitamins will be satisfied. 05

(b) solve the above using the corner-point method. 05

THE END

NORMAL DISTRIBUTION 'Z' TABLE

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0	0.004	0.008	0.012	0.016	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.091	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.148	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.17	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.195	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.219	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.258	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.291	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.334	0.3365	0.3389
1	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.377	0.379	0.381	0.383
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.398	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.437	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.475	0.4756	0.4761	0.4767
2	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817