ICMA Pakistan

SPRING 2013 EXAMINATIONS
Wednesday, the 4th September 2013
BUSINESS MATHEMATICS & STATISTICAL INFERENCE – (ML-202)
SEMESTER-2

Time Allowed: 2 Hours 45 Minutes **Maximum Marks: 90** **Roll No.:**

(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.
(viii) **Question Paper must be returned to invigilator before leaving the examination hall.**

SECTION "A"

Marks

Q. 2 (a) Simplify the following:

(i) $\sqrt[6]{64x^{18}y^{12}}$ **02**

(ii) $\dfrac{(x+3)^2}{(x+1)^2} \div \dfrac{x^2-9}{x^2-1}$ **04**

(b) Solve the equation: $2x^2 - 3x - 2 = 0$ **04**

(c) A sum of Rs.100,000 earns interest at a rate of 18 percent per year compounded quarterly. How long will it take for the investment to grow to Rs. 250,000? **05**

Q. 3 (a) Solve the inequality: $x^2 - 3x + 2 \geq 0$ **05**

(b) The demand function for a firm's product is:

$$q = 10{,}000 - 125p$$

Where 'p' equals the price in rupees and 'q' equals the number of units demanded.

Required:

(i) Determine the price that should be charged to maximize total revenue. **05**
(ii) What is the maximum value for the total revenue? **02**
(iii) How many units are expected to be demanded at maximum revenue? **02**

(c) A couple estimates that they can afford a mortgage payment of Rs. 15,000/- per month. They can obtain a 20 years' mortgage at an interest rate of 18 percent. What is the largest mortgage loan they can afford? **06**

SECTION "B"

Q. 4 (a) The following data represent the lives, recorded in weeks, of 75 car batteries of a certain brand:

Life in weeks	**16 – 20**	**21 – 25**	**26 – 30**	**31 – 35**	**36 – 40**	**41 – 45**	**46 – 50**
No. of batteries	5	9	13	20	18	6	4

Required:

Find the Mode for the above data. **05**

(b) For the given population, find Pearson's Coefficient of Skewness: **06**

19, 25, 10, 27, 16

Marks

(c) Find variance and coefficient of variance for the following data: **08**

Marks	**1 – 20**	**21 – 40**	**41 - 60**	**61 – 80**	**81 – 100**
No. of students	12	19	22	27	20

Q. 5 **(a)** Compute and interpret the correlation coefficient for the following grades of 6 students selected at random: **07**

Accounting grades	85	92	63	45	88	56
Statistics grades	92	80	50	50	85	52

(b) Find 3 monthly moving averages for the following data: **05**

Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Actual sales (units)	450	440	460	410	380	400	370	360	410	450	470	490

(c) If each coded item in a catalog begins with 3 distinct letters followed by 3 distinct non-zero digits, find the probability of randomly selecting one of these coded items having the first letter a vowel and the last digit an odd number. **06**

Q. 6 **(a)** A set of grades in a statistics examination is approximately normally distributed with a mean of 65 and a variance of 60. Find the lowest B, if the top 10% of the students are given A's and the next 20% are given B's. **05**

(b) A random sample of 12 cigarettes of a certain brand has an average nicotine content of 4.3 milligrams and a standard deviation of 1.5 milligrams. Is this in line with the manufacturer's claim that the average nicotine content does not exceed 4 milligrams? Use a 0.05 level of significance and assume the distribution of nicotine contents to be normal. **06**

(c) Random samples of size 2 are drawn from the finite population 4, 6, 8 and 10 with replacement. Construct sampling distribution of mean. **07**

THE END

(Formulas and Statistical Tables on Next Pages)

FORMULAS

(1) $S_n = R\left[\frac{(1+i)^n - 1}{i}\right]$

(2) $A = R\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$

(3) $I = Pin$

(4) $S = P(1+i)^n$

STATISTICAL TABLES

Present value interest factor of an (ordinary) annuity of Re.1 per period at i% for n periods, PVIFA (i, n). (Extract)

Period	1%	1.5%	2%	2.5%	3%	12%	18%	19%	20%
1	0.99010	0.98522	0.98039	0.97561	0.97087	0.89286	0.84746	0.84034	0.83333
2	1.97040	1.95588	1.94156	1.92742	1.91347	1.69005	1.56564	1.54650	1.52778
3	2.94099	2.91220	2.88388	2.85602	2.82861	2.40183	2.17427	2.13992	2.10648
4	3.90197	3.85438	3.80773	3.76197	3.71710	3.03735	2.69006	2.63859	2.58873
5	4.85343	4.78264	4.71346	4.64583	4.57971	3.60478	3.12717	3.05763	2.99061
10	9.47130	9.22218	8.98259	8.75206	8.53020	5.65022	4.49409	4.33893	4.19247
15	13.86505	13.34323	12.84926	12.38138	11.93794	6.81086	5.09158	4.87586	4.67547
20	18.04555	17.16864	16.35143	15.58916	14.87747	7.46944	5.35275	5.10086	4.86958
60	44.95504	39.38027	34.76089	30.90866	27.67556	8.32405	5.55529	5.26300	4.99991
80	54.88821	46.40732	39.74451	34.45182	30.20076	8.33237	5.55555	5.26315	5.00000
100	63.02888	51.62470	43.09835	36.61411	31.59891	8.33323	5.55556	5.26316	5.00000
120	69.70052	55.49845	45.35539	37.93369	32.37302	8.33332	5.55556	5.26316	5.00000
140	75.16823	58.37460	46.87431	38.73899	32.80163	8.33333	5.55556	5.26316	5.00000
160	79.64926	60.51005	47.89650	39.23044	33.03894	8.33333	5.55556	5.26316	5.00000
180	83.32166	62.09556	48.58440	39.53036	33.17034	8.33333	5.55556	5.26316	5.00000
200	86.33136	63.27276	49.04734	39.71339	33.24309	8.33333	5.55556	5.26316	5.00000
220	88.79794	64.14679	49.35889	39.82509	33.28337	8.33333	5.55556	5.26316	5.00000
240	90.81942	64.79573	49.56855	39.89326	33.30567	8.33333	5.55556	5.26316	5.00000
260	92.47610	65.27755	49.70965	39.93486	33.31802	8.33333	5.55556	5.26316	5.00000
280	93.83383	65.63529	49.80460	39.96025	33.32485	8.33333	5.55556	5.26316	5.00000

Standard Normal Probability Table (Extract)

The table shows the area to the left of a z-score:

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
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621

Critical Values of *'t'* Distribution
Significance Level for One-Direction Test (Extract)

df	.10	.05	.025	.01	.005	.000
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.598
3	1.638	2.353	3.182	4.541	5.841	12.941
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.859
6	1.440	1.943	2.447	3.143	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.405
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1.372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
Inf.	1.282	1.645	1.960	2.326	2.576	3.291