



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2020/2021
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF BUSINESS
ADMINISTRATION
BMS 840: QUANTITATIVE TECHNIQUES

DATE: Wednesday, 17th March 2021

TIME: 5.30p.m-8.30p.m

INSTRUCTIONS:

answer question **ONE** and any other **THREE** questions

Question One

- a) The table below shows the tax refunds for 50 tax payers, compute 80 % confidence interval for the mean. (8 marks).

1515	959	1744	589	762
1432	723	764	1901	364
120	1212	868	168	1396
1270	202	1236	1769	668
312	1118	1631	232	1781
1904	1726	681	171	313
1662	1562	1243	271	1067
1857	1518	392	1062	1367
903	1671	1623	1023	283
1313	395	169	800	1973

- b) The weights of sugar in what are nominally '2 kilo' bags are actually normally distributed with mean 2.1 kg and standard deviation 0.1 kg.
- i) What percentage of bags will weigh less than 2.0 kg? (2 marks)
- ii) What percentage will weigh between 2.0 kg and 2.25 kg? (2 marks)
- iii) If only 4% of the bags were to contain under the stated minimum weight, what should this value be? (2 marks)
- iv) If a random sample of 25 bags from another machine has a mean weight of 2.0 kg and a standard deviation of 0.5 kg would its mean production be any different? (2 Marks)

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- c) Police department at Nyairobi claims that the mean response time for domestic disturbance calls is 10 minutes. Kunyak activist group believes that the mean response is greater than 10 minutes. A sample of 35 response time for domestic disturbance calls is obtained and the mean response time is found to be 11.5 minutes and the standard deviation is 6.0. Should the police department claim be rejected at 1% level of significance? (10 marks)
- d) A recent study revealed that 60% of Kenyan use faces masks. A sample of 10 Kenyans on Thika road is selected. What is the probability that
- (i) Exactly seven are wearing face masks? (2 marks)
 - (ii) Seven or few of the Kenyans are wearing face masks? (2 marks)

Question Two

- a) Toret Ltd Company has established that its total cost function is given as $C = \frac{1}{3}x^3 - 5x^2 + 28x + 10$ where C is the total cost and x is the output. A tax rate is pegged at Ksh 2 per unit produced and it becomes part of the total cost of the Toret Ltd Company total cost. The firm also knows that the market demand function is given by $P = 2530 - 5x$, where P is the price per unit of output, find the profit maximizing output and price. (10 marks)

- b) The yearly profits of Toret Ltd are dependent upon the number of workers (X) and the number of units of advertising (Y), according to the function

$$P(x, y) = 412x + 806y - x^2 - 4y^2 - xy - 50,000$$

- i) Determine the number of workers and the number of units in advertising that results in maximum profit. (8 marks)
- ii) Determine maximum profit. (2 marks)

Questions Three

- a) The marginal revenue and the marginal cost for an output x of *logop* product produced by *Logop* ltd are given as $MR = 5 - 4x + 3x^2$ and $MC = 3 + 2x$, if the fixed cost is zero, find the profit function and the profit when the output $x = 4$ (10 marks)
- b) The demand for commercial forest timber has been increasing rapidly over the past three to four decades. The function describing the rate of demand for timber is $d(t) = 20 + 0.003t^2$ where $d(t)$ is stated in billions of cubic feet per year and t equals time in year ($t = 0$ corresponds to January 1 2005)
- (i) Determine the rate of demand at the beginning of 2010. (4 marks)
 - (ii) Determine the rate of demand at the beginning of 2020. (4 marks)
 - (iii) Determine the total demand for timber during the period 2005 through 2024 (2 marks)

Question Four

- a) Explain the characteristics of linear programming. (8 marks)
- b) A company has three alternatives for advertising, television, radio, and newspaper. the cost estimates for each audience coverage are given as follows;

	Television	Newspaper	Radio
Cost per advertisement	Ksh 200,000	Ksh 600,000	Ksh 300,000
The number of people reached	100,000	40,000	18,000

The local newspaper limits the number of weekly advertisement from a single company to ten, no more than half of the total number of advertising should occur on the radio, and at least 10% should occur on television. The weekly advertising budget is Ksh 1,820,000, how many advertisements should be run in each of the three types of media to maximize the total reach. (12 marks)

Question Five

- a) Ten individuals were randomly selected and the number of hours spent per week viewing TV (y) and the number of years of education (x) was recorded as tabulated below.
- (i) calculate the correlation coefficients (4 marks)
- (ii) Find the equation of the regression line and interpret. (6 marks)

X (years of education)	Y (hours spent watching TV)
12	10
14	9
11	15
16	8
16	5
18	4
12	20
20	4
10	16
12	15

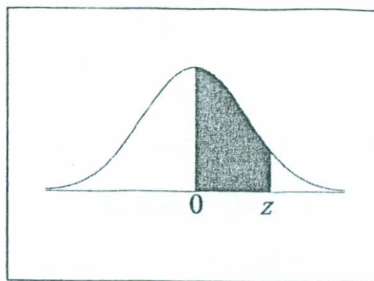
- b) A social researcher is interested in studying the family dynamics caused by gender makeup. The distribution of the number of girls in families consisting of four children is as follows: 6.25% of such families have no girls, 25% have one girl, 37.5% have two girls, 25% have three girls and 6.25% have four girls.

X	P(x)
0	0.0625
1	0.25
2	0.375
3	0.25
4	0.0625
Total	1.0

Compute the mean and the standard deviation of X, the number of girls in a family having four children.

(10 marks)

Standard Normal Distribution Table



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998

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