

GM 03/eGM03  
BUSINESS STATISTICS

Time: Three Hours

Maximum Marks: 100

**Note:**

The paper is divided in three sections: Section A, Section B and Section C. There are 7 questions in Section-A, students are required to attempt ANY FOUR. Section-B has 5 questions, attempt ANY THREE. All the questions of Section-C (Case Study) are compulsory.

**SECTION-A**

1. The following is the sample of duration of 10 randomly selected calls made by a person. Find the mean, median and standard deviation.

Duration of calls (minutes)	3.2	2.8	2.7	4.2	1.7	2.2	2.6	4.1	3.6	3.8
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(10)

2. If 10 nos of switches are picked up of which 20% are defective, what is the expected value of defective switches and variance of defectives. Assume the number of defective follow a binomial distribution.

(10)

3. If  $P(A \cap B) = 0.3$  ;  $P(A) = 0.6$  and  $P(B) = 0.4$  . Based on the above can we say that the events A and B are independent events. Give reasons for your answer.

(10)

4. If  $n = 12$  ,  $p = 0.3$  , the variable (X) is a binomial distributed then find  $P(X > 3)$ .

(10)

5. If  $n = 25$  ,  $p = 0.02$  and X is a binomial distributed variable then find  $P(X \geq 2)$   
(  $e^{-0.5} = 0.6065$  )

(10)

6. Distinguish between Discrete and Continuous Probability Distribution.

(10)

7. Three machines are used to produce a product. Machine 1 produces 20% of the product, Machine 2 produces 35% and the rest are produced using Machine 3.

Each machine do sometimes produce defective products. Probability of producing defective goods using Machine 1 is 0.05 , probability of defective given machine 2 is

used is 0.02 and probability of defective using machine 3 is 0.01. If a random item selected and is found to be defective what is the probability that it was produced in Machine 1.

(10)

## SECTION-B

8. Time taken to complete an examination is normally distributed with a mean of 80 minutes with a standard deviation of 10 minutes.

- a) What is the probability that a student will complete the exam between 70 and 80 minutes?
- b) If the maximum time for the exam is 100 minutes what percentage of students will not be able to complete the exam? (7.5+7.5)

9. In order to estimate the mean rental for two bed room flats in a locality, a sample of 40 houses were taken and the sample mean was Rs. 20750 per month and a standard deviation of 5670.

- a) What is the standard error of the mean?
- b) Find a 90% interval estimate for the mean rental value. (5+10)

10. A report in the Investor's Business daily in the year 2000 reported that the mean work week for the population of workers is 39.2 hours. In 2013 has this time increased is the question which is in the mind of the researcher. To test the same a sample was taken of 112 workers which showed the sample mean to be 40.5 hours with a population standard deviation of 4.8 hours.

- a) Write the null and alternative hypothesis.
- b) Identify the test statistic to be used for the test.
- c) Perform the test at 5% level of significance and conclude your result.

(15)

11. Consider the following hypothesis test:

$$H_0 : \mu_1 - \mu_2 = 0$$

$$H_a : \mu_1 - \mu_2 \neq 0$$

The following are the results for two independent samples taken from the population.

	Sample 1	Sample 2
Sample size	80	70
Sample mean	104	106
Sample standard deviation	8.4	7.6

Carry out the test at 5% level of significance and conclude.

(15)

12. a) Explain what is type I and Type II error  
b) With example explain the difference between paired 't' and independent 't' test.

- c) List the assumptions that are needed for carrying out the independent 't' test.  
(5+5+5)

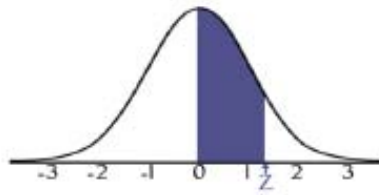
**SECTION-C**  
**Case Study (15 Marks)**

**13.** Three different assembly methods have been proposed for a new product. One of the aspects that was considered was the amount of products produced per hour by using each of the assembly methods. The data is given below:

Method A	Method B	Method C
47	43	49
23	50	44
43	43	37
50	5	16
23	27	9
41	41	25
50	35	34
36	23	22
42	40	38
45	33	36

Perform a one-way ANOVA test at 5% level of significance to check whether each method produced similar level of production.

(table value = 3.35)



### STANDARD NORMAL TABLE (z)

Entries in the table give the area under the curve between the mean and  $z$  standard deviations above the mean. For example, for  $z = 1.25$  the area under the curve between the mean (0) and  $z$  is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	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	0.0910	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	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	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	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	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	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	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	0.4370	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	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998