Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**MCA– SEMESTER –IV - EXAMINATION – WINTER - 2017**

**Subject Code: 3640001 Date: 28-12-2017**

**Subject Name: Basic Statistics**

**Time: 02:30 pm to 05:00 pm Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** Answer the following questions(One Mark Each) **07**

I. What is the mean of first ten natural numbers?

II. Consider a sample with data values of 27, 25, 20, 15, 30, 34, and 28 then what is 50th percentile?

III. Define Inter Quartile Range (IQR)

IV. Define Mutually Exhaustive events.

V. Find mean and standard deviation of binomial distribution if n=10 and p=0.2

VI. Write probability density function of standard normal distribution.

VII. If A and B are mutually exclusive events then find $P(A|B)$.

**(b)** Explain different Sampling Methods. **07**

**Q.2** **(a)** Machines A, B, and C all produce the same two parts, X and Y. Of all the parts produced, machine A produces 60%, machine B produces 30%, and machine C produces 10%. In addition, **07**

40% of the parts made by machine A are part X.
50% of the parts made by machine B are part X.
70% of the parts made by machine C are part X.
A part produced by this company is randomly sampled and is determined to be an X part. With the knowledge that it is an X part, revise the probabilities that the part came from machine A, B, or C.

**(b)** The monthly starting salaries for a sample of 12 graduates are given as: **07**
3355, 3480 , 3310 3450, 3925, 3650, 3540, 3480, 3490, 3520 , 3550 ,3730
(i) Provide a Five - Number Summary.
(ii) Show a box plot.
(iii) Is there any outlier?

**OR**

**(b)** Find the correlation coefficient between the sales and expenses of the following 10 firms.(Figure in '000 Rs.) **07**

| Firms | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sales | 50 | 50 | 55 | 60 | 65 | 65 | 65 | 60 | 60 | 60 |
| Expenses | 11 | 13 | 14 | 16 | 16 | 15 | 15 | 14 | 13 | 13 |

**Q.3** **(a)** Answer the following questions

I. In a production process the diameter of items is distributed normally with mean 4.3 cm and variance 0.09. 200 items are having less than 4 cm diameter. Estimate the total number of items in the production. **04**

II. The probability that a bomb dropped from an aero plane will hit the target is 0.4. Five bombs are dropped from the aero plane to destroy a bridge. 2 bombs are sufficient to destroy the bridge. What is the probability that the bridge will be destroyed? **03**

**(b)** For the following probability distribution of a random variable x, Compute E(x) and Var (x). **07**

| x | 1 | 2 | 4 | 7 | 8 |
|---|---|---|---|---|---|
| f(x) | 0.1 | 0.2 | 0.3 | 0.3 | 0.1 |

**OR**

**Q.3** **(a)** Answer the following questions

I. A machine fills containers with a particular product. Filled weights have a normal distribution with $\sigma = 0.6$ ounce. If only 2% of the containers hold less than 18 ounces, what is the population mean of weight. **04**

II. The time required to pass through security screening at the airport can be annoying to travelers. The mean wait time during peak periods at Cincinnati/Northern Kentucky International Airport is 12.1 minutes. Assume the time to pass through security screening follows an exponential distribution. It is 8:00 A.M. (a peak period) and you just entered the security line. To catch your plane you must be at the gate within 30 minutes. If it takes 12 minutes from the time you liar security until you reaches your gate, what is the probability you will miss your flight? **03**

**(b)** A new automated production process averages 1.5 breakdowns per day. Assume that breakdowns occur randomly, that the probability of a breakdown is the same for any two time intervals of equal length, and that breakdowns in one period are independent of breakdowns in other periods. **07**

I. What is the probability of having exactly two breakdowns during a day?

II. What is the probability of having three or more breakdowns during a day?

**Q.4** **(a)** Answer the following questions

I. Consider the hypothesis, **04**

$H_0 = 22, H_a \neq 22$

A sample of 75 is used and the population standard deviation is $10$. Use $\alpha = 0.01$,compute p-value and state your conclusion for $\bar{x} = 23$

II. Explain Type-I and Type-II errors **03**

**(b)** A sample of items selected from normal population is 10, 5, 7, 8, 20, 25, 15, 2 and 12. Compute point estimate and $95\%$ interval estimate of population mean. **07**

**OR**

**Q.4** **(a)** Answer the following questions

I. In a sample of 500 people from a village, 280 are found to be rice eaters and the rest are wheat eaters. Can we assume that both the food articles are equally popular? **04**

II. Explain types of hypothesis. **03**

**(b)** The following data are from a simple random sample: 5 8 10 7 10 14. **07**

I. What are point estimates of the population mean and standard deviation?

II. Assume the population standard deviation is 25. Compute the standard error of the mean, for sample sizes of 50, 100 and 200. What can you say about the size of standard error of the mean as the sample size is increased?

**Q.5** **(a)** Fit a straight line trend by the method of least squares to the following data and also forecast the earnings for the year 2010. **07**

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|
| Dividend Payment | 2.2 | 2.4 | 3.0 | 5.0 | 6.8 | 8.1 | 9.0 | 9.8 |

**(b)** According to BSNL, $71\%$ of internet users connect their computers to the internet by normal telephone lines. Assume a population proportion **07**

I. What is the probability that a sample proportion from a simple random sample of 350 internet users will within 0.05 of the population

proportion?

II. What is the probability that a sample proportion from a simple random sample of 350 internet users will be 0.75 or greater?

**OR**

**Q.5** **(a)** The estimated regression equation for these data is by $\hat{y} = 0.2 + 2.6x$. Compute SSE, SST, SSR, coefficient of determination and sample correlation coefficient. **07**

| $x_i$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $y_i$ | 3 | 7 | 5 | 11 | 24 |

**(b)** A Population has a mean of $200$ and a standard deviation of $50$. Suppose a simple random sample of size $100$ is selected and $\bar{x}$ is used to estimate. **07**

I. What is the probability that the sample mean will be within 5 of the population mean?

II. What is the probability that the sample mean will be within 10 of the population mean?

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