Researcher	No. of students in each level				Total
	Below Average	Average	Above Average	Genius	
X	86	60	44	10	200
Y	40	33	25	2	100
Total	126	93	69	12	300

Would you say that the sampling techniques adopted by the two researchers are significantly different? **7M**

UNIT–IV

7. a. The following data show the values of sample mean $(\bar{x})$ and range (R) for 10 samples for size 6 each. Calculate the values for central line and the control limits for Mean–chart and Range–chart. Draw the control charts and comment on the state of control. **8M**

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean $(\bar{x})$	43	49	37	44	45	37	51	46	43	47
Range (R)	5	6	5	7	7	4	8	6	4	6

b. The following data refer to the number of defectives in 10 samples of 100 items each. Construct an appropriate control chart. **7M**

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	4	8	11	3	11	7	7	16	12	6

(or)

8. a. Fifteen assemblies are put on accelerated life test without replacement and the test is truncated after 4 failures. If the first four failures occurred at 16.5, 19.2, 20.8 and 37.3 hours, assuming an exponential model,
i) find a 90% confidence interval for the failure rate of such assemblies under these accelerated conditions.
ii) test the null hypothesis that the failure rate is 0.004 failure per hour against the alternative that it is less than 0.004, using the 0.01 level of significance. **7M**

b. A system consists of 7 identical components connected in parallel. What must be the reliability of each component if the overall reliability of the system is to be 0.90? **8M**

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II/IV B.Tech. DEGREE EXAMINATION, JUNE, 2015

Fourth Semester

PROBABILITY AND STATISTICS

Time: 3hours   *Max. Marks: 70*

Part-A is compulsory

Answer One Question from each Unit of Part-B

PART-A

10 x 1 = 10M

a. Define a random variable.

b. Define probability density function.

c. Define Beta distribution.

d. What is point estimation?

e. Define Null hypothesis.

f. Define type–I error.

g. Write the confidence interval for μ.

h. Write the formula for goodness of fit.

i. What is control chart?

j. Write the types of control charts.

PART-B

4 x 15 = 60M

UNIT-I

1. a. The frequency function of a continuous random variable X is given by $f(x) = kx(2 - x)$, $0 \le x \le 2$. Find the value of k, mean and variance of X. **8M**

   b. It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools **7M**
   i) 3% or more   ii) 2% or less will be defective

   (or)

2. a. The mean yield for one-acre plot is 662 kilos with a s.d. 32 kilos. Assuming normal distribution, how many one-acre plots in a batch of 1,000 plots would you expect to have yield **7M**
   i) over 700 kilos   ii) below 650 kilos

   b. Find the mean and standard deviation of sampling distribution of means for the population 2, 3, 4, 5 by drawing samples of size two with replacement. **8M**

UNIT-II

3. a. A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs. 48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area between 472 to 502? **7M**

   b. The average hourly wage of a sample of 150 workers in a plant A was Rs. 2.56 with a standard deviation of Rs. 1.08. The average wage of a sample of 200 workers in a plant B was Rs. 2.87 with a standard deviation of Rs. 1.28. Can an applicant safely assume that the hourly wages paid by plant B are higher than those paid by plant A? **8M**

   (or)

4. a. A trucking firm is suspicious of the claim that the average life time of certain tires is at least 28000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean life time. If 27463 miles with a standard deviation of 1348 miles, what can it conclude if the probability of type-I error is to be at most 0.01? **7M**

   b. The heights of six randomly chosen sailors are in inches: 63, 65, 68, 69, 71 and 72. Those of 10 randomly chosen soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72 and 73. Discuss the heights that these data throw on the suggestion that sailors are on the average taller than soldiers. **8M**

UNIT–III

5. a. Use the 0.01 level of significance to test the null hypothesis that $\sigma = 0.015$ inch for the diameters of certain bolts against the alternative hypothesis that $\sigma \ne 0.015$ inch, given that a random sample of size 15 yielded $s^2 = 0.00011$. **7M**

   b. Two random samples drawn from two normal population are:

Sample I	20	16	26	27	23	22	18	24	25	19		
Sample II	27	33	42	35	32	34	38	28	41	43	30	37

   Obtain estimates of the variances of the populations and test whether the populations have same variances. **8M**

   (or)

6. a. A cigarette manufacturing firm claims that its brand A of the cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another random sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim? (Use 5% level of significance) **8M**

   b. Two researchers adopted different sampling techniques while investigating the same group of students to find the number of students falling in different intelligence levels. The results are as follows: