* S E - 6 2 4 3 / 1 0 0 *

SE-6243

B. E. - II (Sem. III) (IT) Examination

May / June – 2011

Probability & Statistics

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 2 (Sem. 3) (IT)**

Name of the Subject :

☛ **Probability & Statistics**

☛ Subject Code No. : **6 2 4 3** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) All questions are **compulsory**.

(3) Figures on right indicates maximum number of marks.

(4) Attempt each section in **separate** answer books.

SECTION - I

1 (a) Do as directed :

(1) The delay times for cutting 6 parts on an engine lathe are 0.6, 1.2, 0.9, 1.0, 0.6 and 0.8 minutes. Calculate S^2. **3**

(2) If there are 9 cars in a race, in how many different ways can they place first, second and third ? **3**

(3) Check whether $f(x)=\frac{x-2}{2}$ for $x=1, 2, 3, 4$ is a probability distribution. **4**

(b) Attempt any **two** : **12**

(1) Accidents at a potato chip plant are categorized according to the area injured :

fingers	17
eyes	5
arm	2
leg	1

Draw a Pareto chart.

(2) Material manufactured continuously before being cut and wound into large rolls must be monitored for thickness (caliper). A sample of 10 measurements on paper, in mm, yielded

32.2 32.0 30.4 31.2 31.2 30.3 29.6 30.5 30.7
Find the mean and quartiles for this sample.

(3) In how many different ways can the director of a research laboratory choose 2 chemists from among 7 applicants and 3 physicists from among 9 applicants ?

2 (a) A car rental agency has 18 compact cars and 12 intermediate-size cars. If four of the cars are randomly selected for a safety check, what is the probability of getting two of each kind ? **6**

(b) Attempt any **two** : **10**

(1) If the probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18, what is the probability that a system with high fidelity will also have high selectivity ?

(2) A consulting firm rents cars from three agencies, 20% from agency D, 20% from agency E, and 60% from agency F. If 10% of the cars from D, 12% of the cars from E, and 4% of the cars from F have bad tyres, what is the probability that the firm will get a car with bad tyres ?

(3) What is our mathematical expectation if we win \$10 if a balanced car comes up heads and lose \$ 10 if it comes up tails ?

3 Attempt any **two** : **12**

(1) It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least one-third. Accordingly, what are the probabilties that the utility bill will be reduced by at least one-third in

(a) four of five installations

(b) at least four of five installations ?

(2) In a given city, 6% of all drivers get at least one parking ticket per year. Use the Poisson approximation to the binomial distribution to determine the probabilities that among 80 drivers 4 will get at least one parking ticket in any given year.

(3) Prove that $b(x; n, p) = b(n-x; n, 1-p)$

SECTION - II

4 (a) Attempt any **three** : **12**

(1) If a random variable has the probability density

$$f(x) = \begin{cases} 2e^{-2x} & \text{for} \quad x > 0 \\ 0 & \text{for} \quad x \leq 0 \end{cases}$$

Find the probability that it will take on a value (i) between 1 and 3 (ii) greater than 0.5.

(2) A sample of 100 dry battery cells tested to find the length of life produced the following results $\mu = 12$ hrs., $\sigma = 3$ hrs. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life (i) more thatn 15 hrs. (ii) less than 6 hrs.

(3) If 20% of the memory chips made in a certain plant are defective, what are the probabilities that in a lot of 100 randomly choosen for inspection exactly 15 will be defective ?

(4) Find the probabilities that a random variable having the standard normal distribution will take on a value (i) between 0.87 and 1.28 (ii) between –0.34 and 0.62.

(b) Define normal distribution and uniform distribution. Write the formula of mean and variance for both distributions. **6**

5 Attempt any **four** : **16**

(1) If a 1-gallon can of point covers on the average 513.3 square feet with a standard deviation of 31.5 square feet, what is the probability that the sample mean area covered by a sample of 40 of these 1-gallon cans will be anywhere from 510.0 to 520.0 square feet ?

(2) If the distribution of the weights of all men travelling by air between Dollar and El.Paso has a mean of 163 pounds and a standard deviation of 18 pounds, what is the probability that the combined gross weight of 36 men travelling on a plane between these two cities is more than 6,000 pounds ?

(3) The claim that the variance of a normal population is $\sigma^2 = 21.3$ is rejected if the variance of random sample of size 15 exceeds 39.74. What is the probability that the claim will be rejected even through $\sigma^2 = 21.3$?

(4) If two independent samples of sizes $n_1 = 26$ and $n_2 = 8$ are taken from a normal population, what is the probability that the variance of the second sample will be at least 2.4 times the variance of the first sample ?

(5) The t-distribution with 1 degree of freedom is given by

$$f(t) = \frac{1}{\pi}\left(1+t^2\right)^{-1}; -\infty < t < \infty$$

verify the value given for $t_{0.05}$ for $v=1$ in table. [In table $t_{0.05}$ = 6.314 at $v=1$]

6 Attempt any **four** : **16**

(1) A research worker wants to determine the average time it takes a mechanic to rotate the tyres of a car, and she wants to be able to asset with 95% confidence that the mean of her sample is off by at most 0.50 minute. If she can presume from past experience that $\sigma=1.6$ minutes, how large a sample will she have to take ?

(2) The dean of a college wants to use the mean of a random sample to estimate the average amount of time students take to get from one class to the next, and she wants to be able to assert with 99% confidence that the error is at most 0.25 minute. If it can be presumed from experience that $\sigma=1.40$ minutes, how large a sample will she have to take ?

(3) The specifications for a certain kind of ribbon call for a mean breaking strength of 180 pounds. If five pieces of the ribbon (randomly selected from different rolls) have mean breaking strength of 169.5 pounds with a standard deviation of 5.7 pounds test the null hypothesis $\mu=180$ pounds against the alternative hypothesis $\mu<180$ pounds at the 0.01 level of significance. Assume that the population distribution is normal.

(4) To test the claim that the resistance of electric wire can be reduced by more than 0.050 ohm by alloying, 32 values obtained for standard wire yielded $\bar{x}_1=0.136$ ohm and $S_1=0.004$ ohm and 32 values obtained for alloyed wire yielded $\bar{x}_2=0.083$ ohm and $S_2=0.005$ ohm. At the 0.05 level of signifiance, does this support the claim ?

(5) The lapping process which is used to grind certain silicon wafers to the proper thickness is acceptable only if σ, the population standard deviation of the thickness of dice cut from the wafers, is at most 0.50 mil.

Use the 0.05 level of significance to test the null hypothesis $\sigma=0.50$ against the alternative hypothesis $\sigma>0.50$, if the thickness of 15 dice cut from such wafers have a standard deviation of 0.646 mil.
