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UF-6243

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

May / June – 2012

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,.....) : NIL

Seat No. :

Student's Signature

(2) All questions are compulsory.
(3) Figures on right indicate full marks of the questions.
(4) Assume the data wherever necessary.

1 (a) Do as directed :

(i) In how many different ways can 3 of 20 laboratory assistants be chosen to assist with an experiment ? **3**

(ii) A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Find the mean of X. **3**

(iii) Check whether $h(x)=\frac{x^2}{25}$ for $x=0,1,2,3,4$ serve as probability distribution. **4**

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

(i) Damage of a paper mill due to breaking can be divided according to the product.

Toilet paper	132
Hand towels	85
Napkins	43
12 other products	50

Draw a pareto chart.

(ii) A company was experiencing a chronic weld defect problem with a water outlet tube assembly. Each assembly manufactured is leak tested in a water tank. Data were collected on a gap between the flange and the pipe for 6 assemblies that leaked and 6 good assemblies that pases the leak test : Leakers : 0. 290, 0.104, 0.207, 0.145, 0.104, 0.124 Find the standard deviation.

(iii) From 1995 to 2000 the cost of food increased by 53% in a certain city, the cost of housing increased by 40% and the cost of transportation increased by 34%. If the average salaried worker spent 28% of his or her income on food, 35% on housing and 14% on transportation, what is the combined percentage increase in the cost of these times ?

2 (a) In how many different ways can the director of research laboratory choose 2 chemists from among 7 applicants and 3 physicsts from among 9 applicants. **6**

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

(i) If 3 of 20 tyres in a storage are defective and 4 of them are randomly chosen for inspection. What is the probability that only one of the defective tyres will be included ?

(ii) In a bolt factory maschines A, B and C manufacture respectively 25%, 35% and 40% of the total of their output 5,4,2 percents are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machine A ?

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

3 Attempt any two : **12**

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

(ii) Find the probability that 3 of 12 housewives prefer Brand A detergent to Brand B, if they are selected from among 200 housewives among when 40 actually prefer Brand A to Brand B.

(iii) A shipment of 20 tape recorders contains 5 that are defective. If 10 of them are randomly chosen for inspection, what is the probability that 2 of the 10 will be defective.

4 (a) Do as directed : **10**

(i) What is the value of P $(-1 \leq Z \leq 1)$

(ii) Find the cumulative function f(x) corresponding to the density function

$$f(x) = \frac{1}{x^2+1}; \text{ where } -\alpha < x < \infty$$

(iii) Find the probability that a random variable having the standard normal distribution will take on a value between 0.87 and 1.28.

(iv) Find the value of the finite population factor for n=10 and N=1000.

(v) If a random variable has the probability density

$$f(x) = \begin{cases} 2e^{-2x}; x > 0 \\ 0; \ x \leq 0 \end{cases}$$

find variance.

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

(i) The marks of 1000 students in a university are found to be normally distributed with mean 70 and s.d. 5. Estimate the number of students whose marks will be more than 75.

(ii) An electronic company manufactures resistors that have a mean resistance of 100 Ω and a standard deviation of $10\,\Omega$. The distribution of resistance is normal. Find the probability that a random sample of n=25 resistors will have an average resistance less than $9\,\Omega$.

(iii) If the amount of cosmic radiation to which a person is exposed while flying by jet across the united states in a random variable having the normal distribution with μ=4.35 mrem and σ = 0.59 mrem, find the probabilities that the amount of cosmic radiation to which a person will be exposed on such a flight is

(a) between 4.00 and 5.00 mrem.

(b) at least 5.50 mrem

(iv) Find the variance of a uniform distribution.

5 Attempt any four : **16**

(i) The claim that the variance of a normal population is σ^2 = 21.3 is rejected if a variance of a random sample of size 15 exceeds 39.74. What is the probability that the claim will be rejected even though σ^2 = 21.3 ?

(ii) A random sample of a size 25 from a normal population has the mean $\bar{x}$ = 47.5 and the s.d. = 8.4. Does this information tend to support or refute the claim that the mean of the population is μ = 42.1 ?

(iii) The chi-square distribution with 4 degree of freedom is given by,

$$f(x)=\begin{cases}\frac{1}{4}xe^{-x/2}; x>0\\ 0 \qquad\quad ; x\le 0\end{cases}$$

Find the probability that the variance of a random sample of size 5 from a normal population with σ=12 will exceed 180.

(iv) The mean voltage of battery is 15 volt and s.d. 0.2 volt. What is the probability that four such batteries connected in series will have combined voltage of 60.8 or more volts ?

(v) Suppose that the probabilities are 0.082, 0.205, 0.256, 0.214, 0.134, 0.067, 0.028, 0.010, 0.003 and 0.001 that 0,1,2,3....or 9 cars will arrive at a toll booth of a turnpike during any one-minute interval in the early afternoon. distribute the three-digit random numbers from 000 to 999 among the 10 values of this random variable, so that they can be used to simulate the arrival of care at the toll booth.

6 Attempt any two : **12**

(i) Consider n=80, $\bar{x}$ = 18.85 and S^2= 30.77 (S=5.55), construct a 99% confidence interval for the mean.

(ii) In a study of automobile collision insurance costs, a random sample of 80 body repair costs for a particular kind of damage has a mean of Rs. 472.36 and a standard deviation of Rs. 62.35. If $\bar{x}$ = Rs. 472.36 is used as a point estimate of the true average repair cost of this kind of damage, with what confidence can one assert that the error does not exceed Rs. 10 ?

(iii) 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 wafers, is a most 0.50 mil. Use the 0.05 level of significance to test the null hypothesis σ = 0.50 against the alternative hypothesis σ > 0.50, if the thickness of 15 dice cut from such wafers have a standard deviation by 0.64 mil.
