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**RN-6243**

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

**May / June - 2010**

**Probability & Statistics**

Time : 3 Hours]

[Total Marks : 100

**Instruction :**

(1)

नीचे दशावलि निशानीवाणी विगतो उत्तरवडी पर अवश्य लभवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. 2 (Sem. 3) (IT)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Probability &amp; Statistics"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="2"/> <input type="text" value="4"/> <input type="text" value="3"/>	<input type="text" value="Student's Signature"/>
Section No. (1, 2,.....) : <input type="text" value="1&amp;2"/>	

- (2) All questions are compulsory.  
(3) Figures to the **right** indicate full marks.  
(4) Attempt each section in seaprate answer books.

**SECTION - I**

- 1 (a) Do as directed : 10
- (i) What is the probability of drawing a spade from a deck of 52 playing cards.  
(ii) Define dependent events.  
(iii) What is the probability of a sample space ?  
(iv) Find the mean of 15, 14, 2, 27 and 13.  
(v) In how many ways can 3 of 20 assistants be chosen ?
- (b) Attempt any two : 12
- (i) For a computer-controlled lathe whose performance was below per, workers recorded the following causes and their frequencies :
- |                        |    |
|------------------------|----|
| Power fluctuations     | 6  |
| Controller not stable  | 22 |
| Operator error         | 13 |
| Worn tool not replaced | 2  |
| Other                  | 5  |
- Draw a pareto chart.

- (ii) Material manufactured continuously before being at an  $d$  around in to large rolls must be monitored for thickness (caliper). A sample of 10 measurements on paper, in mm, yielded.  
32.2, 32.0, 30.4, 31.0, 31.2, 31.2, 30.3, 29.6, 30.5, 30.7  
find the mean and quartiles for this sample.
- (iii) 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** Attempt any **four** : **16**

- (1) A police department needs new tyres for its patrol cars and the probabilities are 0.17, 0.22, 0.03, 0.29, 0.21 and 0.08 that it will buy uniroyal tires, Good year tires, Michelin tyres, General tyres, Goodrich tyres or Armstrong tyres. Find the probability that it will buy Good year, General or Armstrong tires.
- (2) In an experiment of drawing a card from a well shuffled pack, all the elementary events are equally likely. If the event of getting a heart is denoted by  $H$  and that of an ace is denoted by  $A$ , explain the events  $H \cap A$ ,  $H \cup A$  and find their probabilities.
- (3) The probabilities that a husband and wife will be alive 20 years from now are given by 0.8 and 0.9 respectively. Find the probability that in 20 years neither will be alive.
- (4) What is our mathematical expectation if we stand to win Rs. 5000 if and only if a balanced coin comes upheads ?
- (5) A factory has three production lines I, II and III contributing 20%, 30% and 50% respectively, to its total output. The percentages of substandard items produced by line I, II and III, are, respectively, 15, 10 and 2. If an item chosen at random from the total output is found to be substandard, what is the probability that the item is from line I ?

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

- (1) 10% of the bolts produced by a certain machine turn out to be defective. Find the probability that in a sample of 10 tools selected at random exactly two will be defective using poisson distribution.
- (2) Prove that  $b(x; n, p) = b(n-x; n, 1-p)$ .
- (3) It has been found that only 60% of the riders of two wheelers put on crash-helmets. Find the probability that 4 out of 5 will be using their helmets.

## SECTION - II

- 1 (a) Do as directed : 10
- (1) What is the value of  $P(-1 \leq z \leq 1)$ .
  - (2) If  $P(z > z_\alpha) = \alpha$ , find  $Z_{0.01}$ .
  - (3) Find the cumulative function  $f(x)$  corresponding to the density function  $f(x) = \frac{1}{x^2 + 1}$ , where  $-\infty < x < \infty$ .
  - (4) Find the constant  $k$  such that the function
$$f(x) = \begin{cases} kx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$
is a density function.
  - (5) Define  $k^{\text{th}}$  moment about origin.
- (b) Attempt any **two** : 12
- (1) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation.
  - (2) The amount of radiation to which a patient is exposed while undergoing radiation therapy is a random variable whose distribution may be approximated by  $N(\mu, \sigma) = N(4.45, 0.6)$ . Find the probability that a patient will be exposed to anywhere from 4 to 5.65 units of radiation.
  - (3) An electronic company manufactures resistors that have a mean resistance of  $100 \Omega$  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  $9 \Omega$ .
- 5 Attempt any **four** : 16
- (1) The mean voltage of a battery is 15 volt and s.d. is 0.2 volt. What is the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts ?
  - (2) The claim that the variance of a normal population is  $\sigma^2 = 21.3$  is rejected if the variance of a random sample of size 15 exceeds 39.74. What is the probability that the claim will be rejected even though  $\sigma^2 = 21.3$  ?

- (3) In 16 one hour test runs, the gasoline consumption of an engine averaged 16.4 gallons with a s.d. of 2.1 gallons. Test the claim that the average, gasoline consumption of this engine is 12.0 gallons per hour.
- (4) A random sample of size 25 from a normal population has the mean  $\bar{x} = 47.5$  and the s.d.  $s = 8.4$ . Does this information tend to support or refute the claim that the mean of the population is  $\mu = 42.1$  ?
- (5) If two independent random samples of size  $n_1 = 13$  and  $n_2 = 7$  are taken from a normal population. What is the probability that the variance of the first sample will be atleast four times as that of the second sample ?

**6 Attempt any two :**

**12**

- (1) A research worker wants to determine the average time it takes a mechanic to rotate the tyres of a car, and she want to be able to assert with 95% confidence that the mean of her sample is off by atmost 0.50 minute. If she can presume from past experience that  $\sigma = 1.6$  minutes, how large a sample will she has to take ?
- (2) Consider  $n = 10$ ,  $\bar{x} = 18.85$  and  $s^2 = 30.77$  ( $s = 5.55$ ), construct a 99% confidence interval for the mean.
- (3) A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of  $n_1 = 40$  of its bulbs had a mean life time of 647 hours of continuous use with a s.d. of 27 hours, while a sample of  $n_2 = 40$  bulbs made by its main competitor had a mean life time of 638 hours of continuous use with a s.d. of 31 hours, does this substantiate the claim at the 0.05 level of significance.