

Code: R7220101

R07

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

**PROBABILITY & STATISTICS**

(Common to CE &amp; ME)

Time: 3 hours

Max. Marks: 80

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) If A, B, C are any three events, then show that  

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$
- (b) A business man goes to hotels X, Y, Z 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing.
  - (i) Find the probability that the business man goes to the whole with faulty plumbing.
  - (ii) What is the probability that businessman's room having faulty plumbing is assigned to hotel Z?
- 2 (a) Two dice are thrown. Let X assign to each point (a, b) in S the maximum of its numbers. Find the probability distribution of the random variable X.
- (b) The probability density function of a random variable is given by  $f(x) = y_0 e^{-|x|}$ ,  $-\infty < x < \infty$ . Prove that  $y_0 = 1/2$ . Find the mean and variance of the distribution.
- 3 (a) In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 success are 0.4096 and 0.2048 respectively. Find the parameter 'p' of the distribution.
- (b) Find the mean and variance of the Poisson distribution.
- 4 A population consists of six numbers 4, 8, 12, 16, 20, 24 consider all samples of size two which can be drawn without replacement from this population. Find:
  - (i) Population mean
  - (ii) Population standard deviation
  - (iii) Mean of the sampling distribution of means
  - (iv) Standard deviation of the sampling distribution of means
- 5 (a) Measurements of the weights of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 0.824 and a standard deviation of 0.042. Find 95% confidence limits for the mean weight of all the ball bearings.
- (b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487/- with standard deviation Rs. 48/-. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502?

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- 6 (a) A lady stenographer claims that she can take dictation at the rate of 118 words per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words and a standard deviation of 15 words?
- (b) In a year there are 956 births in a town. A which 52.5% were males, while in towns A and B combined this proportion in a total of 1406 births was 0.496. Is there any significant difference in a proportion of male births in the two towns?
- 7 (a) A random sample of size 25 from a normal population has the mean  $\bar{x} = 47.5$  and the standard deviation  $s = 8.4$ . Does this information support or refuse the claim that the mean of population is  $\mu = 42.1$ .

- (b) The following data gives the fields of interest and attitude to religion:

	Arts and commerce	Science and engineering	Total
Conformist	109	51	160
Non conformist	23	17	40
Total	132	68	200

Examine whether the field of interest and attitude to religion are associated.

- 8 Telephone users arrive at a booth following a Poisson distribution with an average time of 5 minutes between one arrival and the next. The time taken for a telephone call is on an average 3 minutes and it follows exponential distribution.
- (i) What is the probability that the booth is busy?
- (ii) How many more booths should be established to reduce the waiting time to less than or equal to half of the present waiting time?

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