R09

Code No: 56066

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, November/December - 2020
PROBABILITY AND STATISTICS
(Aeronautical Engineering)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. The contents of urns I, II and III are as follows:
1 white, 2 black and 3 red balls
2 white, 1 black and 1 red balls and
4 white, 5 black and 3 red balls
One urn is chosen at random and two balls drawn, if they happen to be white and red, what is the probability that they come from urns I, II or III? [15]

2. Probability density function of a random variable x is defined as

$$f(x) = \begin{cases} \frac{1}{2}\sin x\,, for\ 0 < x < \pi \\ 0, else\ where \end{cases}$$

Then find
a) The mean
b) The variance of the distribution. [7+8]

3.a) Distinguish between point estimation and interval estimation.
b) Explain the terms:
i) Null hypothesis
ii) Critical region
iii) Level of significance. [5+10]

4.a) A college claims that its average class size is 35 students. A random sample of 64 students has a mean size of 37 students with a standard deviation of 6 students. Test at the $\alpha = 0.05$ level of significance if the claimed value is too low.
b) A company claims that the mean selling price for a certain type of imported sports car is $42,000. A survey of 16 randomly selected owners of such cars shows that they actually paid a mean of $44,200 with a standard deviation of $6000 for their cars. Test if the company's claim is too low at the 0.05 level of significance. [7+8]

5.a) Describe the $\chi 2$ – test of goodness of fit.
b) Describe the F – test for equality of variances of the two populations. [5+10]

6. Show that the coefficient of correlation lies between -1 and +1. [15]

7. Consider a single-server queue with infinite buffer space
a) Consider the situation
• The inter-arrival time is a constant and is given by 1 sec
• The service time required by each customer is always 0.5 sec 2.
What is the mean waiting time per customer?
b) Consider the situation
• The inter-arrival time is exponentially distributed with mean 1 sec
• The service time required by each customer is exponentially distributed with mean 0.5 sec.
What is the mean waiting time per customer?
c) Compare the answers of (a) and (b), what conclusions can you draw? [5+5+5]

8.a) How do you define a Markov Chain?
b) Show that every finite state Markov Chain contains at least one recurrent set of states. [5+10]

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