

Code No: 54001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, August/September - 2022

PROBABILITY AND STATISTICS

(Common to CE, IT)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Define Conditional probability. State and Prove Baye's theorem.  
b) Define random variable.  
A random variable  $X$  has the following probability function values:
- |         |   |     |      |      |      |       |        |          |
|---------|---|-----|------|------|------|-------|--------|----------|
| $x:$    | 0 | 1   | 2    | 3    | 4    | 5     | 6      | 7        |
| $p(x):$ | 0 | $k$ | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ | $7k^2+k$ |
- i) Find  $k$   
ii) Evaluate  $P(X < 6)$ ,  $P(X \geq 6)$  and  $P(0 < X < 5)$ . [7+8]
- 2.a) Define Binomial distribution. If A and B play a game in which their chance of winning are in the ratio 3:2, then find A's chance of winning at least three games out of the five games played.  
b) If  $X$  is a normal variate with mean 30 and S.D. 5, then find the probabilities that i)  $26 \leq X \leq 40$  and ii)  $X \geq 45$  [7+8]
- 3.a) Explain Type I and Type II errors in testing of hypothesis.  
b) The average hourly wage of a sample of 150 workers in a plant 'A' was Rs.2.56 with a standard deviation of Rs. 1.08. The average wage of a sample of 200 workers in plant 'B' was Rs. 2.87 with a standard deviation of Rs. 1.28. Can an applicant safely assume that the hourly wages paid by plant 'B' are higher than those paid by plant 'A'? [7+8]
- 4.a) Twenty people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more, at 5% level (use large sample test).  
b) A company has the head office at Calcutta and a branch at Bombay. The personnel director wanted to know if the workers at the two places would like the introduction of a new plan of work and a survey was conducted for this purpose. Out of a sample of 500 workers at Calcutta, 62% favoured the new plan. At Bombay out of a sample of 400 workers, 41% were against the new plan. Is there any significant difference between the two groups in their attitude towards the new plan at 5% level? [7+8]
5. A pair of dice are thrown 360 times and the frequency of each sum is indicated below:
- |           |   |   |    |    |    |    |    |    |    |    |    |    |
|-----------|---|---|----|----|----|----|----|----|----|----|----|----|
| Sum       | : | 2 | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |
| Frequency | : | 8 | 24 | 35 | 37 | 44 | 65 | 51 | 42 | 26 | 14 | 14 |
- Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance? [15]

6.a) Prove that the correlation coefficient is the geometric mean between the regression coefficients.

b) Ten competitors in a musical test were ranked by the three judges A, B and C in the following order:

Ranks by A: 1      6      5      10      3      2      4      9      7      8

Ranks by B: 3      5      8      4      7      10      2      1      6      9

Ranks by C: 6      4      9      8      1      2      3      10      5      7

Using rank correlation method, discuss which pair of judges has the nearest approach to common likings in music. [7+8]

7.a) Explain M/M/1 queuing model with characteristics.

b) Explain pure birth and death process in detail. [8+7]

8. Explain Markov chains in detail. [15]

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