Code No: 123AN **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
PROBABILITY AND STATISTICS
(Common to ME, CSE, IT, MCT, AME, MIE, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) What is the expected number of heads appearing when a fair coin is tossed three times? [2]

b) Prove that the total area under the normal curve is unity. [3]

c) Prove that correlation coefficient is the geometric mean of the two regression coefficients. [2]

d) Define covariance of two random variables. When are two random variables uncorrelated. [3]

e) Define Type-I and Type-II errors. [2]

f) A sample of size 10 drawn from a normal population has a mean 31 and variance 2.25. Is it reasonable to assume that the mean of the population is 30? Use 1% LOS. [3]

g) Define transient state and steady state in a queue model. [2]

h) Explain the operating characteristics of a queueing system. [3]

i) Write down the Chapman-Kolmogorov equations. [2]

j) If the transition probability matrix of a Markov chain is $\begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$, find the steady state distribution. [3]

PART-B

(50 marks)

2.a) A random variable X is defined as the sum on the faces when a pair of dice is thrown. Find the probability mass function of X and the expected value of X.

b) Explain Binomial distribution. Derive its moment generating function and hence find its mean and variance. [5+5]

OR

3.a) Define mathematical expectation. Prove the multiplication theorem of expectation.

b) Explain normal distribution. If the mean height of sorghum varieties to be 68.22 inches with a variance of 10.8 inches, how many varieties in a field of 100 varieties, would you expect to have 6 feet tall? [5+5]

6.a) A cantilever beam of length 7 m, carries a point load 60 kN at a distance of 5 m from the fixed end. Find the deflection and slope under the point load and also at the free end. Take $E = 2.1\times10^5$ MPa and $I = 89 \times 10^6$ mm^4.

b) What are the assumptions made to find the deflections and slopes in the beam? Explain in detail. [8+7]

7.a) State the assumptions made in the analysis of thin cylindrical shells.

b) A shell 5 m long, 1.4 m in diameter is subjected to an internal pressure of 1.4 MPa. If the thickness of the shell is 10 mm, find the circumferential and longitudinal stresses. Find also maximum shear stress and the changes in the dimensions of the shell. Take $E = 2.07\times10^5$ N/mm^2 and Poisson's ratio = 0.3. [7+8]

8.a) A cylindrical compressed air drum is 2 m in diameter with plates 12.5 mm thick. The efficiencies of the longitudinal (η_L) and circumferential (η_c) joints are 85% and 45% respectively. If the tensile stress in the plating is to be limited to 100 MPa, find the maximum safe air pressure.

b) Show that the volumetric strain of cylindrical shell is the sum of longitudinal strain and twice that of hoop strain. [8+7]

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