Department of Mathematics
National Institute of Technology, Srinagar.

B.Tech 4th Semester	Subject	Examination	Session	Time allowed	Max. Marks
CSE/IT	Statistics & Prob.	Major	Spring-2018	3 Hours	60

NOTE: Attempt any four questions all questions carry equal marks..

Q. 1 (a) A random variable X is said to have the Beta distribution with parameters α and β, prove that $\mu = \dfrac{\alpha}{\alpha+\beta}$ and $\sigma^2 = \dfrac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

(b) Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results:

Horse A: 28 30 32 33 33 29 34

Horse B: 29 30 30 24 27 29

Test whether the two horses have the same running capacity.

(c) State and prove Bayes Theorem. **(7, 4, 4) [CO4,CO3]**

Q.2 (a) What is moment generating function. Find the moment generating function of a random variable having density function

$$f(x) = \begin{cases} e^{-x} & x \geq 0 \\ 0 & otherwise \end{cases}$$

determine the first four moments about the origin. Find $E\left(e^{2X/3}\right)$.

(b) Assuming that the height distribution of a group of men is normal, find the mean and standard deviation, if 84% of the men have heights less than 65.2 inches and 68% have height lying between 65.2 and 62.8 inches. **(7, 4, 4) [CO1, CO4]**

Q.3 (a) For a chi-square distribution with n degrees of freedom, find its moments, β_1 and β_2.

(b) A random variable X has density function

$$f(x) = \begin{cases} cx^2 & 1 \leq x \leq 2 \\ cx & 2 \leq x < 3 \\ 0 & otherwise \end{cases}$$

Find (i) the constant c, (ii) $P(X > 2)$ (iii) $P(1/2 < X < 3/2)$. **(9, 6) [CO4]**

Q.4 (a) If X is a Poisson variate with mean m, show that $\dfrac{X-m}{\sqrt{m}}$ is a variable with mean zero and variance unity. Find the M.G.F for this variable and show that it approaches to $e^{\frac{t^2}{2}}$ as $m \to \infty$.

(b) A coin is tossed 5 times. What is probability of getting at least 2 tails? In four throws with a pair of dice, what is probability of throwing doublets: (i) twice (ii) at least twice?

(c) The arithmetic mean of a certain distribution is 5. The second and the third moments about the mean are 20 and 140 respectively. Find the third moment of the distribution about 10.

(6,6,3) [CO1]

Q.5 (a) The following table gives experimental values of the pressure P of a given mass of gas corresponding to various values of the volume V. According to thermodynamic principles, a relationship having the form $PV^{\gamma} = C$, where γ and C are constants, should exist between the variables. (i) Find the values of γ and C. (ii) Write the equation connecting P and V. (iii) Estimate P when V=100.0 in^3.

(b) Prove that the coefficient of correlation lies between +1 and -1. Also prove that the it is the geometric mean of the coefficient of regression. **(8,7) [CO5,C06]**

Volume V (in^3)	54.3	61.8	72.4	88.7	118.6	194
Pressure P (lb/in^2)	61.2	49.5	37.6	28.4	19.2	10.1