M 26158

Reg. No. : ....

Name : ....

VII Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, November 2014
(2007 Admn. Onwards)
PT 2K6/2K6 EC 705 (A) : PROBABILITY AND RANDOM PROCESS

Time : 3 Hours Max. Marks : 100

1. a) If the events A and B are independent. Show that $\bar{A}$ and B are also independent.

 b) A continuous random variable X has a pdf $f(x) = Kx^2e^{-x}$, $x \geq 0$. Find K, mean and variance.

 c) A fair die is tossed 720 times. Use Tchebycheff inequality to find a lower bound for the probability of getting 100 to 140 sixes.

 d) The mean and variance of a binomial distribution are 4 and $4/3$ respectively. Find $P(X \geq 1)$.

 e) If the joint pdf of (X, Y) is given by $f(x, y) = 24y(1-x)$, $0 \leq y \leq x \leq 1$ find E(XY).

 f) The life time of a certain brand of an electric bulb may be considered a random variable with mean 1200 h and s.d. 250 h. Find the probability using central limit theorem, that the average life time of 60 bulbs exceeds 1250 h.

 g) A radio active source emits particles of a rate 5 per minute in accordance with Poisson process. Each particle emitted has a probability of 0.6 being recorded. Find the probability that 10 particles are recorded in 4-min. period.

 h) Define Markov process, Markov chain. **(8×5=40)**

2. a) i) There are 3 true coins and 1 false coin with 'head' on both sides. A coin is chosen at random and tossed 4 times. If head occurs all the 4 times, what is the probability that the false coin has been chosen and used ? **8**

 ii) If the pdf of a random variable X is given by $f(x) = \begin{cases} 1/4, & -2 < x < 2 \\ 0, & \text{else where} \end{cases}$,

 find $p\{|X| > 1\}$. **7**

OR

P.T.O.

b) i) A continuous random variable has the pdf $f(x) = Kx^4$, $-1 < x < 0$, find the value of K and also $P\left(X > -\frac{1}{2} / X < -\frac{1}{4}\right)$. **7**

ii) There are 2 bags one of which contains 5 red and 8 black balls and the other 7 red and 10 black balls. A ball is drawn from one or the other of the 2 bags. Find the chance of drawing a red ball. **8**

3. a) Fit a Poisson distribution for the following distribution : **15**

x :	0	1	2	3	4	5
f :	142	156	69	27	5	1

OR

b) In a certain examination the percentage of students passing an getting distinctions were 55 and 9 respectively. Estimate the average marks obtained by the students, the minimum marks for pass and distinction being 44 and 75 respectively. **15**

4. a) i) If the random variable X is uniformly distributed in (0, 1) find the pdf of $Y = \frac{1}{X+1}$. **7**

ii) If X, Y, Z are uncorrelated random variables with zero mean and standard deviation 5, 12 and 9 respectively and if $U = X + Y$ and $V = Y + Z$, find the correlation co-efficient between U and V. **8**

OR

b) i) If the joint pdf of (X, Y) is given by $f(x, y) = x + y$, $0 \leq x, y \leq 1$. Find f_{xy}. **7**

ii) A distribution with unknown mean μ has variance equal to 1.5. Use central limit theorem to find how large a sample should be taken from the distribution in order that the probability will be at least 0.95 that the sample mean will be within 0.5 of the population mean. **8**

5. a) Given a random variable Y with characteristic function $\phi(w) = E\{e^{iwY}\}$ and a random process defined by $X(t) = \cos(\lambda t + Y)$, show that $\{X(t)\}$ is stationary in the wide sense if $\phi(1) = \phi(2) = 0$. **15**

OR

b) If $X(t) = \mu + V(t)$ where V(t) is a white noise with $C(t_1, t_2) = \phi(t_1)\,\delta(t_1 - t_2)$ where $\phi(t)$ is a bounded function of t and δ is the unit impulse function, prove that $\{X(t)\}$ is a mean – ergodic process. **15**
