PES University, Bengaluru
(Established under Karnataka Act 16 of 2013)

UE14EC255

END SEMESTER ASSESSMENT (ESA) SUMMER TERM JULY 2016 B. TECH. (ECE) IV-SEM

UE14EC255 – PROBABILITY AND RANDOM PROCESSES

Time: 3 Hrs		Answer All Questions	Max Marks: 100
1	a)	Write every possible subset of following two sets: {a, b} and {f, g, h}.	8
	b)	How many subsets can be formed from a set of N elements?	4
	c)	Sketch a Venn diagram for three events where A ∩ B ≠ Ø, B ∩ C ≠ Ø, C ∩ A ≠ Ø, but A ∩ B ∩ C = Ø.	8
2	a)	Two cards are drawn sequentially from a pack of 52 cards (the first card is not replaced). (i) Given the first card is a queen, what is the probability that the second is also a queen? (ii) What is the probability that both cards are queens?	8
	b)	A man wins a gambling game if he gets two heads in five flips of a biased coin. The probability of getting a head with the coin is 0.7. Find the probability that the man will win.	6
	c)	Define cumulative probability distribution function, and state its four properties.	6
3	a)	A random variable has uniform density in the range (a, b), and zero density elsewhere. Prove that the density is 1/(b − a) in the range (a, b).	6
	b)	Find condition on constant d, such that the function, $f_X(x) = d\,[1 − (x/b)]$ in the range $0 < x < c$ (and $f_X(x) = 0$ elsewhere), is a valid density function. (b and c are positive)	8
	c)	List three properties of density function.	6
4	a)	Define (i) expectation (ii) moments about the origin (iii) central moments (iv) variance, and (v) skew.	10
	b)	Prove that nth moment of a random variable X, is given by: $m_n = d^n M_X(v) / dv^n$ at $v=0$, where $M_X(v)$ is a moment generating function.	10
5	a)	Express marginal density functions in terms of joint density function, $f_{XY}(x, y)$, of two random variables, X and Y.	5
	b)	Independent random variables X and Y have moments, $m_{10} = 2$, $m_{20} = 14$, $m_{02} = 12$, $m_{11} = -6$. Find the moment μ_{22}.	10
	c)	Define power density spectrum of a random process in terms of autocorrelation function.	5