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PES UNIVERSITY

PES University, Bengaluru
(Established under Karnataka Act No. 16 of 2013)

UE19EC201

Dec 2021: END SEMESTER ASSESSMENT (ESA) B TECH 3rd SEMESTER

UE19EC201 – Mathematics for Electronics Engineers

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Obtain analytic function as a function of z given $u - v = (x - y)(x^2 + 4xy + y^2)$.	8
	b)	Expand $f(z) = e^z$ about the point $z = a$ using Taylor series.	4
	c)	If C is the circle $\|z\| = 2$, evaluate $\int_C \frac{z\,e^z}{(z^2-1)}\,dz$ using residue theorem.	8
2	a)	An sub attempts to sink an aircraft carrier. It will be successful only if two or more torpedoes hit the carrier. If the sub fires three torpedoes and the probability of a hit is 0.4 for each torpedo, what is the probability that the carrier will be sunk?	7
	b)	Draw the CDF and PMF of Rolling a die with Ω = {1,2,3,4,5,6}, and X = {1,2,3,4,5,6}. What is the probability of X>4.	7
	c)	List down any three properties of CDF and PMF.	6
3	a)	Write a note on exponential and Uniform R.V with their expression of CDF, PDF with examples/applications.	8
	b)	Find the Moment Generating function of Binomial RV and hence find the expectation.	6

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	c)	Given that a RV X has a CDF $F_X(x)$, calculate the CDF of the random variable $Y = X^2$.	6
4	a)	Given two independent R.V X and Y with pdfs $f_X(x)$ and $f_Y(y)$, respectively, show that the PDF of $Z = X + Y$ is $f_Z(z) = f_X(x) * f_Y(z)$.	8
	b)	Show that X and Y are independent if $\mathbb{E}(XY) = \mathbb{E}(X)\mathbb{E}(Y)$.	4
	c)	List down any four properties of covariance matrix of Gaussian random vectors.	8
5	a)	Show that the random process $X(t) = Acos(\omega_0 t + \theta)$ is WSS if it is assumed that A and ω_0 are constants and θ is uniformly distributed random variable on the interval (0,2π).	8
	b)	Mention any four properties of power spectral density.	4
	c)	Find the mean and mean square value of system response of a LTI system.	8