Course Code: 23BS3T03

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II-B. Tech I-Semester Supplementary Examinations (BR23), Mar - 2026

COMPLEX VARIABLES AND RANDOM PROCESS (ECE)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-AandPart-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Determine the complex function f(z) = $z^2 + 4$ is continuous at point z = 2i.	(2M)	CO1	BL2
b)	State Cauchy generalized integral formula.	(2M)	CO1	BL1
c)	State Laurent's series for complex function.	(2M)	CO2	BL1
d)	Find the residue of $\frac{e^z}{(z-3)}$ at z = 3.	(2M)	CO2	BL2
e)	What is the probability one man and two women selected at random from the group contains 3 men and 2 women?	(2M)	CO3	BL2
f)	If a random variable has a poisson distribution such that P(1) = P(2), then find the value of λ.	(2M)	CO3	BL2
g)	Define Marginal density function.	(2M)	CO4	BL1
h)	Define statistical independence of two random variables.	(2M)	CO4	BL1
i)	List the properties of power density spectrum.	(2M)	CO5	BL1
j)	Define cross power density function.	(2M)	CO5	BL1

PART–B (5X10 = 50M)

		Marks	CO	BL
2a.	Determine whether the complex function $f(z)=\frac{x-iy}{x^2+y^2}$ is analytic or not.	(5M)	CO1	BL3
b.	Evaluate $\int_C \frac{\cos \pi z}{z-3}\,dz$ around the circle $\lvert z\rvert = 2$.	(5M)	CO1	BL3
	(OR)			
3a.	Determine analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$ using Milne-Thomson method.	(5M)	CO1	BL4
b.	Using Cauchy's integral theorem, to evaluate $\int_C \frac{z^2+4}{(z-3)}dz, where\, C: \lvert z\rvert = 2$.	(5M)	CO1	BL3
4a.	Find Taylor's series expansion of $f(z)=\frac{1}{z^2+z-6}$ about z = -1.	(5M)	CO2	BL3
b.	Expand Laurent series expansion of $f(z)=\frac{z}{z^2-5z+6}$ when the region is	(5M)	CO2	BL3

$2 < |z| < 3$.

(OR)

5. Evaluate $\int_0^\infty \frac{dx}{\left(x^2 + a^2\right)^2}$ using Cauchy's residue theorem. (10M) CO2 BL4

6a. The probability function of a random variable as follows

X=x	0	1	2	3	4	5	6
P(X)	k	2k	2k	3k	3k	2k	k

(5M) CO3 BL3

Determine (i) the value of k (ii) $P(X > 4)$ (iii) $P(2 < X < 4)$.

b. Three light bulbs are chosen at random from 12 light bulbs in which 5 are defective. Find the probability that (i) All are defective (ii) One is defective . (5M) CO3 BL3

(OR)

7a. A person receives an average of 4 telephone calls a day. Assuming Poisson distribution, what is the probability that on a given day he will receive (i) No telephone call (ii) Exactly only one call? (5M) CO3 BL3

b. Assume that 50% of all engineering students are good in Mathematics. Determine the probabilities that among 18 engineering students (i) exactly 10 (ii) at least 10. (5M) CO3 BL3

8 If X is a discrete random variable with a Moment generating function of Mx(v), find the Moment generating function of i) Y= aX+b ii) Y=KX iii) Y= (X+a)/b. 10(M) CO4 BL3

(OR)

9. The joint probability mass functions of X and Y is given as 10(M) CO4 BL3

P(x, y)		Y		
		0	1	2
X	0	0.1	0.04	0.02
	1	0.08	0.2	0.06
	2	0.06	0.14	0.30

Compute the marginal PMF of X and Y, $P[X \le 1, Y \le 1]$ and verify X, Y are independent or not?

10a. Check the following power spectral density functions are valid or not (5M) CO5 BL3

$(i)\frac{\cos 8\omega}{2+\omega^4}\ (ii)\, e^{-(\omega-1)^2}$

b. Derive the relation between input PSD and output PSD of an LTI system. (5M) CO5 BL2

(OR)

11a. Find the cross correlation function corresponding to the cross power spectrum (5M) CO5 BL3

$S_{XY}(\omega) = \frac{6}{\left(9+\omega^2\right)\left(3+j\omega\right)^2}$.

b. State the properties of cross power spectral density of response. (5M) CO5 BL2

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