

II B. Tech I Semester Regular Examinations, March - 2021
COMPLEX VARIABLES AND STATISTICAL METHODS
(Common to CE, EEE, ME and ECE)

Time : 3 Hours

Max. Marks : 60

Note : Answer ONE question from each unit (5 × 12 = 60 Marks)

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**UNIT-I**

1. a) Find the imaginary part of the analytic function whose real part is  $u = y + e^x \cos y$ . [6M]

b) Evaluate  $\oint_C \frac{z^3 - \sin 3z}{(z - \frac{\pi}{2})^3} dz$  where C is the circle  $|z|=2$ . [6M]

**(OR)**

2. a) Show that  $u(x, y) = 4xy - 3x + 2$  is harmonic and hence construct corresponding analytic function in terms of 'z'. [6M]

b) Evaluate  $\oint_C \frac{2z-1}{z(z+2)(2z+1)} dz$  where C is the circle  $|z|=1$ . [6M]

**UNIT-II**

3. a) Develop  $f(z) = \frac{1}{z^2 - 4z + 3}$  as Laurent's series in the ring-shaped region  $1 < |z| < 3$ . [6M]

b) Find the poles and corresponding residues of the function  $\frac{ze^z}{(z-1)^3}$ . [6M]

**(OR)**

4. a) Find Taylor's series expansion of  $f(z) = \frac{1}{z^2}$  about the point  $z = 1$ . [6M]

b) Apply Residue theorem to evaluate  $\oint_C \frac{4-3z}{z(z-1)(z-2)} dz$  where C is the circle  $|z| = \frac{3}{2}$ . [6M]

**UNIT-III**

5. A random variable X has the following probability distribution. [12M]

|      |   |    |    |    |    |    |    |    |
|------|---|----|----|----|----|----|----|----|
| X    | 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| P(X) | k | 2k | 3k | 4k | 5k | 6k | 7k | 8k |

Determine i) k ii) mean iii) variance and iv)  $P(X > 2)$ .

**(OR)**

6. a) In a bolt factory machines, A, B, C manufacture 20%, 30%, 50% of the total of their output and in which 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that it is manufactured from (i) machine A (ii) machine B. [6M]
- b) Assume that the probability that a bomb dropped from an aero plane will strike a certain target is  $1/5$ , if 6 bombs are dropped, find the probability that (i) Exactly 2 will strike the target (ii) At least two will strike the target. [6M]

**UNIT-IV**

7. a) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as draw from the same population of S.D 2.5 inches. [6M]
- b) In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters, can we assume that both rice and wheat are equally popular in this state at 1% level of significance. [6M]

**(OR)**

8. a) A sample of 400 items is taken from a population whose S.D. is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. [6M]
- b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same, at 5% level. [6M]

**UNIT-V**

9. a) Find a straight line by the method of least squares to the following data [6M]

|   |   |     |     |     |     |
|---|---|-----|-----|-----|-----|
| x | 0 | 1   | 2   | 3   | 4   |
| y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

- b) The velocity  $V$  of a liquid is known to vary with the temperature according to the quadratic law  $V = a + bT + cT^2$ . Find the best values of a, b and c to the following data [6M]

|   |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|
| T | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
| V | 2.31 | 2.01 | 3.80 | 1.66 | 1.55 | 1.47 | 1.41 |

**(OR)**

10. a) Derive an equation of the form  $y = ab^x$  to the following data by the method of least squares [6M]

|   |     |       |       |       |       |
|---|-----|-------|-------|-------|-------|
| X | 2   | 3     | 4     | 5     | 6     |
| Y | 144 | 172.8 | 207.4 | 248.8 | 298.6 |

- b) Fit a least Square curve of the form  $y = ae^{bx}$  for the following data where a and b are Constants [6M]

|   |    |    |    |    |    |
|---|----|----|----|----|----|
| x | 1  | 5  | 7  | 9  | 12 |
| y | 10 | 15 | 12 | 15 | 21 |

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