

# UTTARAKHAND TECH. UNIVERSITY

## B TECH

### SUB:- MATHAMATICS III

### UTU PREVIOUS YEAR QUESTION PAPERS

time : 3hr]

Total marks :100

#### SECTION A

Q1:- Attempt any **two** of the following :

1. (i) Show that function  $u = x^3 - 3xy^2$  is harmonic and find the corresponding analytic function.
2. (ii) If  $w = f(z) = u + iv$  and  $u - v = e^x (\cos y - \sin y)$ , find  $w$  in terms of  $z$ .
3. Evaluate

4. 
$$\int_C \frac{12z-7}{(z-1)(2z+3)} dz$$
 where C is the circle

5. (i)  $|z| = 2$ , (ii)  $|z + i| = \sqrt{3}$

6. Apply calculus of residues to evaluate

7. 
$$\int_0^{\pi} \frac{1 + 2\cos \theta}{5 + 4\cos \theta} d\theta$$

#### SECTION B

Q2:- Attempt any **two** of the following :

1. By Newton-Raphson method find the value of  $(48)^{1/3}$ , correct to three decimal places.
2. The table gives the distance in natural miles of the visible horizon for the given heights in feet above the earth's surface.

x(height)	100	150	200	250	300	350	400
X(distance)	10.63	13.03	15.04	16.81	18.42	19.90	21.27

3.

- Find the values of  $y$  when  $x = 218$  ft and  $x = 410$  ft.
- By means of Newton's divided difference formula, find the value of  $f(8)$  and  $f(15)$  from the following table :

$x$	4	5	7	10	11	13
$fx$	48	100	294	900	1210	2028

6.

### SECTION C

Q3:- Attempt any **two** of the following :

- Evaluate

$$\int_0^{\pi/2} \sin x \, dx$$

- by Simpson's 1/3rd rule, using 11 ordinates.

- Using Runge-kutta method of fourth order, find  $y$  for  $x = 0.1, 0.2$  and  $0.3$  given that

$$dy/dx = xy + y^2, \quad y(0) = 1$$

- Solve by Crout's method, the following system of equations :

$$5. \quad x + y + z = 3, \quad 2x - y + 3z = 16, \quad 3x + y - z = -3$$

### SECTION D

Q4:- Attempt any **two** of the following :

- Establish the formula  $\delta_{x-y}^2 = \delta_x^2 + \delta_y^2 - 2r\delta_x\delta_y$  where  $r$  is the correction coefficient between  $x$  and  $y$ . Using the above formula calculate the correlation coefficient from the following data relating to the marks of 10 candidates in aptitude test ( $x$ ) and achievement ( $y$ ) :

Aptitude( $x$ )	22	53	46	67	43	35	88	11	95	13
Achievement( $y$ )	18	39	31	42	55	64	82	10	96	14

- The first four moments of a distribution about  $x = 2$  are 1, 2.5, 5.5 and 16. Calculate the first four moments about the mean and about origin.
- If 10% of the bolts produced by machine are defective, determine the probability that out of 10 bolts chosen at random
  - (i) One
  - (ii) None
  - (iii) at most two bolts, will be defective.

**(ONLY FOR CIVIL, ME, IPE, AND AUTOMOBILE ENGG.)**

Q5:- Attempt any **two** of the following :

- In normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.
- Fit a second degree parabola to the following data by least squares method:

Aptitude( $x$ )	1929	1930	1931	1932	1933	1934	1935	1936	1937
Achievement( $y$ )	352	356	357	358	360	361	361	360	359

- The following are the mean lengths and ranges of length and ranges of lengths of a finished product from 10 samples each of size 5. The specification limits for length are  $200 \pm 5$  cm. Construct  $\bar{A}$  and R-chart and examine whether the process is under control and state your recommendations:

Sample No	1	2	3	4	5	6	7	8	9	10
Mean $\bar{A}$	201	198	202	200	203	204	199	196	199	201
Range (R)	5	0	7	3	3	7	2	8	5	6

- 5.
6. Assume for  $n=5$ ,  $A_2 = 0.58$ ,  $D_4 = 2.11$  and  $D_3 = 0$ .