

# AR13

CODE: 13BS2007

SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, October-2021

COMPLEX VARIABLES AND STATISTICAL METHODS

(Electrical and Electronics Engineering)

Time: 3 Hours

Max Marks: 70

## PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) Find the real and imaginary parts of  $f(z)=\sin z$   
b) Define Entire function with an example  
c) Determine the location and order of the zeros of the function  $f(z)=1-\cos z$   
d) Find the singular points of the function  $f(z) = (z + 1)\sin\left(\frac{1}{z-2}\right)$   
e) Find the poles of the function  $f(z) = \frac{1}{\cos z - \sin z}$   
f) Define conformal mapping  
g) State any two properties of Normal distribution  
h) Define sampling  
i) Define Type-I and Type-II errors.  
j) How many different samples of size  $n=2$  can be chosen from a finite population of size  $N=7$

## PART-B

Answer one question from each unit

[5x12=60M]

### UNIT-I

2. Evaluate  $\oint_C \frac{dz}{z^2+9}$  over the circle  $C:|z-3i|=4$  using Cauchy's integral formula. 12M

(OR)

3. State the necessary and sufficient conditions for the derivative of the function  $w=f(z)$  to exist for all values of  $z$  in a region  $R$ . Construct the regular function whose imaginary part is  $e^{-x}(x\cos y + y\sin y)$  12M

### UNIT-II

4. a) Evaluate  $\int_C \frac{z-3}{z^2+2z+5} dz$  where  $C:|z|=1$ . 6M  
b) Determine the poles of the function  $f(z)=\frac{z^2}{(z+2)(z-1)^2}$  and the residue at each pole. 6M

(OR)

5. Apply Residue theorem to evaluate  $\int_0^\infty \frac{\cos ax}{x^2+1} dx$  12M

### UNIT-III

6. Find the bilinear transformation which maps  $R(z) > 0$  into interior of unit circle so that  $z = \infty, i, 0$  map into  $w = -1, -i, 1$ . **12M**

(OR)

7. a) Find invariant points of the transformation  $w = \frac{1+iz}{1-iz}$ . **6M**  
b) Find the Bilinear transformation which maps  $z = \infty, i, 0$  into the points  $w = 0, i, \infty$ . **6M**

### UNIT-IV

8. a) Box I contains 1 white and 999 red balls. Box II contains 1 red and 999 white balls. A ball is picked from a randomly selected box. If the ball is red, what is the probability that it came from box one. **6M**  
b) Find the probabilities that a random variable having the standard normal distribution will take on a value (i) between 0.87 and 1.28 (ii) greater than 0.85. **6M**

(OR)

9. Three machines produce 70%, 20% and 10% of the total number of items in a factory. The percentage of the defective output of these machines is 4%, 3% and 2% respectively. An item is selected at random and found defective. Find the probability that it is from machine I. **12M**

### UNIT-V

10. a) A store keeper wanted to buy a large quantity of light bulbs from 2 brands labeled one and two. He bought hundred bulbs from each brand and found by testing that brand one has mean life time of 1120 hours and standard deviation of 75 hours and brand 2 has mean life time of 1062 hours and standard deviation of 82 hours. Examine whether the difference of means is significant. **6M**  
b) If 1-gallon can of paint covers on the average 513.3 square feet with a standard deviation of 31.5 square feet, what is the probability that the sample mean area covered by a sample of 40 of these 1-gallon cans will be anywhere from 510.0 to 520.0 square feet? **6M**

(OR)

11. In a city, 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of the men in this city are smokers. **12M**

# AR13

**CODE: 13ME2008**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**II B.Tech II Semester Supplementary Examinations, October-2021**

**FLUID MECHANICS AND HYDRAULIC MACHINERY  
(Mechanical Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

## **PART-A**

**ANSWER ALL QUESTIONS**

**[1 x 10 = 10 M]**

1. a) State hydrostatic law.  
b) Differentiate between path line and streak line.  
c) What is flownet?  
d) What are Navier-Stokes equations.  
e) Why is co-efficient of discharge of an orificemeter much smaller than that of venturimeter?  
f) What is a flow nozzle meter?  
g) What is a surge tank? What is its use.  
h) Differentiate between impulse and reaction turbines.  
i) Mention the losses and efficiencies in centrifugal pumps.  
j) Classify different types of centrifugal pumps.

## **PART-B**

**Answer one question from each unit**

**[5x12=60M]**

### **UNIT-I**

2. a) Explain the working of a U-tube differential manometer. 6M  
b) A plate weighing 150 N and measuring 0.8 m x 0.8 m slides down an inclined plane over an oil film of 1.2 mm thickness. For an inclination of 30° and a velocity of 0.2 m/s, compute viscosity of the fluid. 6M
- (OR)
3. a) Define vapour pressure and explain its influence on fluid motion 6M  
b) What do you mean by surface tension? If the pressure difference between the inside and outside of the air bubble of diameter 0.01 mm is 29.2 kPa, what will be the surface tension at air-water interface? 6M

### **UNIT-II**

4. a) For a flow of viscous fluid flowing through a long circular tube under laminar flow conditions show that the average velocity is half the maximum velocity. 6M  
b) A 30 cm diameter pipe conveying water branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. 6M

**(OR)**

5. a) Derive Bernoulli's equation for flow along a stream line. 6M
- b) A 300 mm diameter pipe carries water under a head of 20 metres with a velocity of 3.5 m/s. If the axis of the pipe turns through  $45^\circ$ , find the magnitude and direction of the resultant force at the bend 6M

### UNIT-III

6. a) Explain Total energy line and hydraulic gradient line. 6M
- b) A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is used to measure the flow of water. The pressure at inlet is  $0.18 \text{ N/mm}^2$  and the vacuum pressure at the throat is 280 mm of mercury. Find the rate of flow. The value of  $C_d$  may be taken as 0.98. 6M

(OR)

7. a) Describe an orificemeter and find an expression for measuring discharge of fluid through a pipe with this device. 6M
- b) Three pipes of the same length  $L$ , diameter  $D$  and friction factor  $F$  are connected in parallel. Determine the diameter  $d$  of a single pipe of length  $L$  and friction factor  $F$  which will carry the same discharge for the same head loss. 6M

### UNIT-IV

8. Design a Francis turbine runner with the following data. Net head = 68m, speed = 750 rpm, output power = 330 kW, hydraulic efficiency = 94%, overall efficiency = 85%, flow ratio = 0.15, breadth ratio = 0.1, inner dia of runner is 0.5 outer dia. Also assume 6% of circumferential area of the runner to be occupied by the thickness of the vanes. Velocity of flow remains constant throughout the flow and is radial at exit. 12M

(OR)

9. a) Explain the working of a Pelton wheel with a neat sketch. 6M
- b) What is specific speed of a turbine? Derive the expression for the same. 6M

### UNIT-V

10. a) Explain the working of a single stage centrifugal pump with a neat sketch. 6M
- b) Explain about indicator diagrams. 6M

(OR)

11. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of  $40^\circ$  at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine: 12M
  - (i) Vane angle at inlet,
  - (ii) Work done by impeller on water per second, and
  - (iii) Manometric efficiency.