

**B TECH**  
**(SEM III) THEORY EXAMINATION 2018-19**  
**MATHEMATICS-III**

Time: 3 Hours

Total Marks:70

Notes: Assume any Missing Data.

## SECTION – A

1. Attempt **ALL** parts of the following:

7 X 2 = 14

- a) The function  $f(x) = e^x(\cos y + i \sin y)$  is holomorphic or not.
- b) Find the residue of  $\frac{z^2}{(z-1)(z-2)^2}$  at pole  $z = 2$ .
- c) Formula of Measure of Kurtosis  $\beta_2 =$
- d) The first three central moments of a distribution are 0, 15, -31. Find the moment coefficient of skewness.
- e) Obtain the function whose first difference is  $9x^2 + 11x + 5$ .
- f) Find the normal equation of a curve  $y = ax + bx^2$
- g) Let  $f(z) = u(r, \theta) + iv(r, \theta)$  be an analytic function. If  $u = -r^3 \sin 3\theta$ , then find  $v$ .

## SECTION – B

2. Attempt any **THREE** parts of the following:

3 X 7 = 21

- a) From the following table of values of  $x$  and  $y$ , obtain  $\frac{dy}{dx}$  for  $x = 1.2, 2.2, 1.6$ .

$x:$	1.0	1.2	1.4	1.6	1.8	2.0	2.2
$y:$	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

- b) Using Runge-Kutta method of fourth order, find  $y(0.8)$  correct to 4 decimal places if  $\frac{dy}{dx} = y - x^2$ ,  $y(0.6) = 1.7379$ , taking  $h = 0.1$ .
- c) Using complex integration method, evaluate  $\int_0^{2\pi} \frac{\cos 2\theta}{5+4 \cos \theta} d\theta$ .
- d) The equations of two regression lines, obtained in a correlation analysis of 60 observations are:  
 $5x - 6y = 24$ ,  $768x - 100y = 3608$ . What is the correlation coefficient? Show that the ratio of coefficient of variability of  $x$  to that of  $y$  is  $\frac{5}{24}$ . What is the ratio of variances of  $x$  and  $y$ ?
- e) The pressure of the gas corresponding to various volumes  $V$  is measured, given by the following data:

$V(\text{cm}^3)$	50	60	70	90	100
$P(\text{kg cm}^{-2})$	64.7	51.3	40.5	25.9	78

## SECTION – C

3. Attempt any **TWO** parts of the following:

2 X 3.5 = 07

- a) Find the unique polynomial  $P(x)$  of degree 2 such that:  $P(1) = 1$ ,  $P(3) = 27$ ,  $P(4) = 64$ , use Lagrange method of interpolation.
- b) Using Simpson's  $\frac{3}{8}$ <sup>th</sup> rule on integration, evaluate  $\int_0^6 \frac{1}{1+x} dx$
- c) Expand  $\frac{1}{z^2-3z+2}$  in the region  $1 < |z| < 2$ .

4. Attempt any **TWO** parts of the following: **2 X 3.5 = 07**
- a) If the probability of hitting a target is 10% and 10 shots are fired independently. What is the probability that the target will be hit at least once?
- b) A die is thrown 276 times and the results of these throws are given below:

No. appeared on the die	1	2	3	4	5	6
Frequency	40	32	29	59	57	59

Test whether the die is biased or not. [Tabulated value of  $\chi^2$  at 5% level of significance for 5 degree of freedom is 11.09]

- c) By Residue method, find the inverse Z-transform of  $\frac{z}{z^2+7z+10}$
5. Attempt any **TWO** parts of the following: **2 X 3.5 = 07**
- a) The following data regarding the heights (y) and weights (x) of 100 college students are given:

$$\sum x = 15000, \sum x^2 = 2272500, \sum y = 6800, \sum y^2 = 463025, \sum xy = 1022250$$

- b) Solve  $x^3 - 5x + 3 = 0$  by using Regula-Falsi method correct up to four decimal places.
- c) From the table, estimate the number of students who obtained marks between 40 and 45.

Marks:	30-40	40-50	50-60	60-70	70-80
No. of Students:	31	42	51	35	31

6. Attempt any **TWO** parts of the following: **2 X 3.5 = 07**
- a) Find the residue of  $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$  at its pole and hence evaluate  $\int_C f(z) dz$ , where  $C$  is the circle  $|z| = 5/2$
- b) Determine the largest Eigen value and corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \text{ till three approximation.}$$

- c) Verify Cauchy theorem by integrating  $e^{iz}$  along the boundary of the triangle with the vertices at the points  $1 + i, -1 + i$  and  $-1 - i$ .

7. Attempt any **TWO** parts of the following: **2 X 3.5 = 07**
- a) Use Picard's method to obtain  $y$  for  $x = 0.2$ . Given:  $\frac{dy}{dx} = x - y$  with initial condition  $y = 1$  when  $x = 0$  correct up to four decimal places.
- b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. It is given that if  $f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-\frac{1}{2}x^2} dx$  then  $f(0.5) = 0.19, f(1.4) = 0.42$
- c) Prove that  $hD = -\log(1 - \nabla) = \sin h^{-1}(\mu\delta)$