3rd Civil

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# 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 Runga-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($cm^3$) | 50 | 60 | 70 | 90 | 100 |
|---|---|---|---|---|---|
| P($kg\ cm^{-2}$) | 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 $3/8^{th}$ 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 $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ 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 $hD = -\log(1-\nabla) = \sin h^{-1}(\mu\delta)$