| $x$ | 0 | 1 | 2 | 4 | 5 | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- | ---: |
| $f(x)$ | 1 | 14 | 15 | 5 | 6 | 19 |

5. Attempt any two parts of the following : $\quad(\mathbf{2} \times \mathbf{1 0}=\mathbf{2 0})$
(a) Test if the following system of equations is diagonally dominant, and hence solve this system using Gauss-Seidal's method :
$10 x+15 y+3 z=14$
$-30 x+y+5 z=17$
$x+y+4 z=3$.
(b) (i) A rod is rotating in a plane. Following data gives the angle $\theta$ (radian) through which the rod has turned for various values of time $t$ (seconds) :

| t | 0 | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\theta$ | 0 | 0.12 | 0.49 | 1.12 | 2.02 | 3.20 | 4.67 |

Calculate the angular velocity of the rod at $\mathrm{t}=0.2 \mathrm{sec}$.
(ii) The velocities of a car which starts initially from rest (running on a straight road) at intervals of 2 minutes are given below :

| time (minutes) | 2 | 4 | 6 | 8 | 10 | 12 |
| :--- | :--- | :--- | :--- | :--- | :--- | ---: |
| velocity $(\mathrm{Km} / \mathrm{hr})$ | 22 | 30 | 27 | 18 | 7 | 0 |

Apply Simpson's $3 / 8$ rule to find the distance covered by the car.
(c) Estimate $\mathrm{y}(0.8)$ if $2 \mathrm{y} \frac{\mathrm{dy}}{\mathrm{dx}}=\mathrm{x}^{2}$ and $\mathrm{y}(0)=2$, using RungeKutta method of fourth order by taking $\mathrm{h}=0.4$.

EAS401
(Following Paper ID and Roll No. to be filled in your Answer Book)


## B.Tech.

(SEM. IV) THEORY EXAMINATION 2013-14 MATHEMATICS-III

Time : 3 Hours
Total Marks : 100
Note :- Attempt all questions.

1. Attempt any four parts of the following :
$(4 \times 5=20)$
(a) Show that $\mathrm{f}(\mathrm{z})=\log \mathrm{z}$ is analytic everywhere in the complex plane except at the origin.
(b) Find an analytic function whose imaginary part is $e^{-x}(x \cos y+y \sin y)$.
(c) Use Cauchy's integral formula to show that $\int_{c} \frac{e^{\mathrm{zt}}}{\mathrm{z}^{2}+1} \mathrm{dz}=2 \pi \mathrm{i}$ sint if $\mathrm{t}>0$ and c is the circle $|\mathrm{z}|=3$.
(d) Obtain the Taylor's series expansion of $f(z)=\frac{1}{z^{2}-4 z+3}$ about the point $z=4$. Find its region of covergence.
(e) Determine the poles and residues at each pole for $f(z)=\frac{z-1}{(z+1)^{2}(z-2)}$ and hence evaluate $\oint_{c} f(z) d z$ where c is the circle $|\mathrm{z}-\mathrm{i}|=2$.
(f) Evaluate:

$$
\int_{0}^{2 \pi} \frac{\cos 3 \theta}{5+4 \cos \theta} \mathrm{~d} \theta .
$$

2. Attempt any two parts of the following :
$(2 \times 10=20)$
(a) The following table represents the height of batch of 100 students. Calculate Kurtosis :

| Height (in cm) | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of Students | 0 | 2 | 6 | 20 | 40 | 20 | 8 | 2 | 2 |

(b) Fit the curve $\mathrm{pv}^{\mathrm{r}}=\mathrm{K}$ to the following data:

| $\mathrm{p}\left(\mathrm{kg} / \mathrm{cm}^{2}\right)$ | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 |
| :--- | :---: | :---: | :---: | :---: | ---: | ---: |
| $v$ (litres) | 1620 | 1000 | 750 | 620 | 520 | 460 |

(c) Ten students got the following percentage of marks in principles of Economics and Statistics :

| Roll Nos. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Marks in Economics | 78 | 36 | 98 | 25 | 75 | 82 | 90 | 62 | 65 | 39 |
| Marks in Statistics | 84 | 51 | 91 | 60 | 68 | 62 | 86 | 58 | 53 | 47 |

Calculate the coefficient of correlation.
3. Attempt any two parts of the following:
$(2 \times 10=20)$
(a) 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 $f(t)=\frac{1}{\sqrt{2 \pi}} \int_{0}^{t} e^{-\frac{x^{2}}{2}} d x$, then $f(0.5)=0.19$ and $f(1.4)=0.42$.
(b) In a survey of 200 boys of which 75 were intelligent, 40 had educated fathers, while 85 of the unintelligent had uneducated father. Does this figure support the hypothesis that educated father's have intelligent boys. (Ask for $\chi^{2}$ table)
(c) In a blade manufacturing factory, 1000 blades are examined daily. Draw the ' $n p$ ' chart for the following table and examine whether the process is under control ?

| Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| No. of |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Defective |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| blades | 9 | 10 | 12 | 8 | 7 | 15 | 10 | 12 | 10 | 8 | 7 | 13 | 14 | 15 | 16 |

Attempt any four parts of the following :
$(4 \times 5=20)$
(a) Find the root of the equation $\log _{10} \mathrm{x}-\mathrm{x}+3=0$ using bisection method correct to three decimal places.
(b) Find the rate of covergence for Regula-Falsi method.
(c) Prove that $\nabla=-\frac{\delta^{2}}{2}+\sqrt[\delta]{1+\frac{\delta^{2}}{4}}$, where symbols have their usual meaning for finite differences.
(d) Obtain the missing term for following table :

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| :--- | :--- | ---: | :--- | :--- | :--- | :--- | :--- | ---: |
| $\mathrm{f}(\mathrm{x})$ | 2 | $\overline{4}$ | 8 | - | 32 | - | 128 | 256 |

Explain, why the results differ from 16 and 64.
(e) The following table gives the population of a town during the last six censuses. Estimate the population in year 1913.

| Year | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 |
| :--- | :--- | :--- | :--- | :--- | :--- | ---: |
| Population <br> (in <br> thousands) | 12 |  |  |  |  |  |

(f) Use Newton's dividend difference formula to find the value of $f(3)$ from the following data :

