|  | VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST - 625234 DEPARTMENT OF MATHEMATICS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05AT01 | Programme: | B.Sc | CIA: | I |
| $\theta^{9} \theta^{3}=$ | Date: | 06.10.2021 | Major: | Physics/ Chemistry | Semester: | III |
| HAND प\|नAI IIEAM | Duration: | 2 Hours | Year: | I | Max.Marks: | 50 |
|  | Course Title: | MATHEMATICS-I |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The derivative of $\sin x$ is $\qquad$ CO1
(A) $-\cos x$
(B) $\cos x$
(C) $\tan x$
(D)None

2 The expansion of coshx is $\qquad$
(A) $\frac{1}{2}\left(e^{x}+e^{-x}\right)$
(B) $\frac{1}{2}\left(e^{x}-e^{-x}\right)$
(C) $\frac{e^{x}+e^{-x}}{2 i}$
(D) None

3 The derivative of coshx is $\qquad$ CO1
(A) $\sinh x$
(B) $-\sinh x$
(C) $\operatorname{sech} x$
(D) None

4 The derivative of sechx is $\qquad$
$\begin{array}{ll}\text { (C) } \tanh ^{2} x & \text { (D) None }\end{array}$
(A) sechxtanhx
(B) $-\operatorname{sech} x \tanh x$

5 The derivative of $\operatorname{cosec}^{-1} x$ is $\qquad$ $\mathrm{CO2}$
(C) $\frac{-1}{x \sqrt{x^{2}-1}}$
(A) $\frac{1}{x \sqrt{x^{2}-1}}$
(B) $\frac{1}{\sqrt{1+x^{2}}}$
(D) None

6 If $x=\tan \theta$ then $\left(3 x-x^{2}\right) /\left(1-3 x^{2}\right)$ is
CO2
(A) $\sin 3 \theta$
(B) $\cos 3 \theta$
(C) $\tan 3 \theta$

7 The value of $\int \frac{1}{x} d x$ is
(A) $-\log x$
(B) $1 / \log x$
(C) $\log x$
(D)None

8 The value of $\int \operatorname{cosec}^{2} x d x$ is
(A) $-\operatorname{cosec} x \cot x$
(B) $\cot x$
(C) $-\cot x$
(D) None

9 The value of $\int \frac{1}{x \sqrt{x^{2}-1}} d x$ is
(A) $\operatorname{cosec}^{-1} x$
(B) $\sec ^{-1} \mathrm{x}$
(C) $\cot ^{-1} \mathrm{x}$
(D) None

10 The value of $\int \sec x d x$ is
(A) $\log (\sec x+\tan x)$
(B) $\log (\sec x-\tan x)$
(C) $\sec x \tan x$
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Find the value of $\cos 3 \theta$.
12 If $x+i y=\sin (A+i B)$ prove that $\frac{x^{2}}{\sin ^{2} A}-\frac{y^{2}}{\cos ^{2} A}=1$.
13 Find the derivatives of $\sqrt{\sin \sqrt{x}}$.
14 Find $y^{\prime}$ if $x=a \cos ^{3} t, \quad y=a \sin ^{3} t$.
15 Write the formula for $\int_{-a}^{a} f(x) d x$.

$$
a
$$

16 Write the formula for $\int_{0}^{a} f(x) d x$.

17 Evaluate $I=\int_{0}^{1}\left(x^{2}\right)^{3 / 2} d x$.

# SECTION - C (Understanding) 

Answer any THREE Questions:
18 Prove that $\operatorname{Cos} 8 \theta=128 \cos ^{8} \theta-256 \cos ^{6} \theta+160 \cos ^{4} \theta-32 \cos ^{2} \theta+1 \quad$ CO1
19 Separate into real and imaginary parts $\sinh (\alpha+i \beta)$.
20 If $x^{y}=y^{x}$ prove that $\frac{d y}{d x}=\frac{y(y-x \log y)}{x(x-y \log x)}$.
21 Find the derivative of $x^{\sin x}$ w.r.t $(\sin x)^{x}$.
22 Evaluate $I=\int_{0}^{\frac{\pi}{4}} \log (1+\tan \theta) d \theta$.

## SECTION - D (Applying)

Answer any ONE Question:
23 Separate into real and imaginary parts $\tan (x+i y)$. CO1
$24 \frac{1}{d y} \quad \mathbf{C O 2}$
24 Find $\frac{d y}{d x}$ if $y=x^{x}+x^{\frac{1}{x}}$.


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DEPARTMENT OF MATHEMATICS

| Course Code: | 05AT31 | Programme: | B.Sc | CIA: | I |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 06.10 .2021 | Major: | Mathematics | Semester: | III |
| Duration: | 2 Hours | Year: | II | Max.Marks: | 50 |
| Course Title: | PROGRAMMING IN C |  |  |  |  |

SECTION - A
Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The execution of a C program start from $\qquad$ .

CO1
(A) function
(B) Header file
(C) main()
(D) Processor

2 Identifiers are $\qquad$ . CO1
(A) user-defined names (B) reserved keywords
(C) C statements
(D) tokens

3 Which of the following is not a correct variable type?
(A) float
(B) real
(C) int
(D) double

4 The declaration of C variable can be done $\qquad$ _.
(A) anywhere in the program.
(B) in declaration part.
(C) in executable part.
(D) at the end of the program.

5 C programs are converted into machine language with the help of
CO2
(A) an editor
(B) a compiler
(C) an operating system
(D) None

6 The \& operator displays $\qquad$ .

CO2
(A) address of the variable.
(B) value of the variable.
(C) result of the variable
(D) both (a) \& (b).

7 What is the value of $20 \% 10$ ?
$\mathrm{CO3}$
(A) 8
(B) 2
(C) 1
(D) 0

8 Recursion is a process in which a function calls $\qquad$ . $\mathrm{CO3}$
(A) itself
(B) another function
(C) main( ) function
(D) sub program

9 By default the function returns _.

CO
(A) integer value
(B) float value.
(C) char value.
(D) double

10 If a storage class is not mentioned in the declaration then default storage class is $\qquad$ .
$\mathrm{CO3}$
(A) automatic
(B) static
(C) external
(D) register

## SECTION - B

Answer any FIVE Questions:
11 Define Variables shortly? CO1
12 Define data type? CO1
13 What is meant by constants? $\mathbf{C O 2}$
14 Describe shortly about output statement? CO2
15 What is called as getch ()? CO3
16 Give a suitable example to get output as 15.624 in the variable X . $\mathbf{C O 3}$
17 Give notes on conditional statements. $\mathbf{C O 3}$

## SECTION - C

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Explain about various types of constant in C?
CO1
19 Explain Logical operators? CO1
20 Write short note on Go To statement? CO2
21 Write in detail about simple if statement? CO2
22 Write a C program to find the roots of the quadratic equations? CO3
SECTION - D
Answer any ONE Question:
(1X 12= 12 Marks)
23 Discuss in detail of about various types of C operators? CO1
24 Explain Switch statement with suitable example? CO2

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| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05CT11 | Programme: | B.Sc | CIA: | I |
|  | Date: | 19.10.2021 | Major: | Mathematics | Semester: | I |
|  | Duration: | 2 Hours | Year: | I $\square$ | Max.Marks: | 50 |
|  | Course Title: | ALGEBRA AND TRIGONOMETRY |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( $10 \times 1$ X $\mathbf{1 0}$ Marks)
1 The value of $\cosh 2 x=$ $\qquad$ .
(A) $\cosh ^{2} \mathrm{x}+\sinh ^{2} \mathrm{x}$
(B) $\cosh ^{2} \mathrm{x}-\sinh ^{2} \mathrm{x}$
(C) $\cosh x+\sinh x$
(D) None

2 The value of $\cosh x=$ $\qquad$ .
(A) $\frac{e^{x}+e^{-x}}{2}$
(B) $\frac{e^{x}-e^{-x}}{2}$
(C) $\frac{e^{x}+e^{-x}}{2 i}$
(D) None

3 The imaginary part of $\sin (x+i y)$ is $\qquad$ .

CO1
(A) $\cos x+\sinh y$
(B) cosx sinhy
(C) $\cos x-\sinh y$
(D) None

4 If z and w are complex numbers then $\mathrm{z}^{\mathrm{w}}$ can be defined as $\qquad$ —.
(A) $e^{-w \log z}$
(B) $\mathrm{e}^{\mathrm{w} \log \mathrm{z}}$
(C) $e^{z \log w}$
(D) None

5 If z is a complex number then $\log \mathrm{z}$ has $\qquad$ .

CO2
(A) finite number
(B) infinite number of values
(C) zero
(D) None

6 If z is real then $\log \mathrm{z}$ is $\qquad$ .
(A) Complex number (B) real number
(C) rational number
(D) None

7 If $f(x)$ is a polynomial then $\qquad$ is the reminder when $f(x)$ is divided by $x-a$.
(A) 0
(B) $f(a)$
(C) 1
(D) None

8 If $\alpha, \beta, \gamma$ are the roots of the equation $x^{3}+\mathrm{px}^{2}+q \mathrm{q}+\mathrm{r}=0$, then the value of $\sum \alpha^{2}$
(A) $p^{2}$
(B) $p^{2}-2 q$
(C) 2 q
(D) None

9 In a transformation of equation, the reciprocal equation is derived by substituting x by
CO3
$\qquad$ _.
(A) $-x$
(B) $1 / \mathrm{x}$
(C) $x^{2}$
(D) None

10 In an equation $\mathrm{x}^{\mathrm{n}}+1=0$ has only -1 as real roots if n is $\qquad$ .
(A) even
(B) odd
(C) zero
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Write the expansion of $\tan (\mathrm{A}+\mathrm{B}+\ldots)$.
12 If $\sin ^{2} \theta+\cos ^{2} \theta=1$, show that $\cosh ^{2} x-\sinh ^{2} x=1$.
13 Define general logarithm.
14 Find $\log (1-\mathrm{i})$.
CO2
15 Define equation. $\mathbf{C O 3}$
16 Find the roots of the given function $x^{3}-7 x+6=0$.
CO3
17 State any one properties of existence of root of a function.
CO3

Answer any THREE Questions:
18 If $\frac{\sin \theta}{\theta}=\frac{5045}{5046}$, show that $\theta=1^{\circ} 58^{\prime}$ approximately.
19 Express $\sin ^{3} \theta \cos ^{5} \theta$ in a series of sines of multiples of $\theta$.
20 Find the general value of $\log _{-3}-2$. CO2
21 Find the sum to infinity the series, $c \sin \alpha+\frac{\mathrm{c}^{x}}{2!} \sin 2 \alpha+\frac{\mathrm{c}^{\mathrm{s}}}{3!} \sin 3 \alpha+\ldots$. CO 2

22 Find the sum of the cubes of the roots of the equation $x^{5}=x^{2}+x+1$. CO 3

## SECTION - D (Applying)

Answer any ONE Question:
23
(i) Express $\frac{\sin 7 \theta}{\sin \theta}=7-56 \sin ^{2} \theta+112 \sin ^{4} \theta-64 \sin ^{6} \theta$
(ii) Separate into real and imaginary parts $\tan (x+i y)$.

24 Find the sum to infinity the series, $\cos \alpha+\frac{1}{2} \cos (\alpha+\beta)+\frac{1.3}{2.4} \cos (\alpha+2 \beta)+\ldots$. CO 2

| Course Code: | 05CT12 | Programme: | B.Sc. | CIA: | I |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 22.10 .2021 | Major: | Mathematics | Semester: | I |
| Duration: | 2 Hours | Year: | I | Max.Marks: | 50 |

Course Title: DIFFERENTIAL CALCULUS

## SECTION - A (Remembering)

Answer ALL the Questions:
( 10 X 1 = 10 Marks)
1 The value of $\cosh ^{2} x+\sinh ^{2} x$ is $\qquad$ CO1
(A) 0
(B) $\cosh 2 x$
(C) 1
(D) None

2 The value of $1-\tanh ^{2} x$ is $\qquad$ (B)
(C) $-\operatorname{coth}^{2} x$
(D) None

3 The value of $1-\operatorname{coth}^{2} x$ is $\qquad$
(B) $\operatorname{coth}^{2} \mathrm{x}$

C
CO1
(A) $\operatorname{sech}^{2} \mathrm{x}$
(B) $\operatorname{cosech}^{2} \mathrm{x}$
(C) $-\operatorname{cosech}^{2} x$
(D) None

4 The derivative of sinh $x$ is $\qquad$
(B) $\cosh x$
(C) $\operatorname{cosech} x$
(D) None

5 The derivative of coshx is $\qquad$ B)
(C) $\operatorname{sech} x$
(D) None
(A) $\sinh x$
(B) $-\sinh x$

- 1
(A) $\frac{-1}{x \sqrt{x^{2}-1}}$
(B) $\frac{1}{x \sqrt{x^{2}-1}}$
(C) $\frac{1}{x \sqrt{1-x^{2}}}$
(D) None

7 The derivative of $\operatorname{cosech}^{-1} x$ is $\qquad$
(A) $\frac{1}{x \sqrt{x^{2}-1}}$
(B) $\frac{-1}{x \sqrt{x^{2}+1}}$
(C) $\frac{1}{x \sqrt{x^{2}-1}}$
(D) None

8 If $x=\tan \theta$, then $\frac{2 x}{1-x^{2}}$ is
(A) $\sin 2 \theta$
(B) $\cos 2 \theta$
(C) $\tan 2 \theta$
(D) None

9
If $x=\tan \theta$, then $\frac{2 x}{1+x^{2}}$ is
(A) $\sin 2 \theta$
(B) $\cos 2 \theta$
(C) $\tan 2 \theta$
(D) None

10 If $x=\tan \theta$, then $\frac{3 x-x^{3}}{1-3 x^{2}}$ is
(A) $\sin 3 \theta$
(B) $\cos 3 \theta$
(C) $\tan 3 \theta$
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Find the Differential coefficient of $y=\left(x^{2}+1\right)(x+2)$
12 Solve $\frac{d}{d x}\left(e^{x} \sin x\right)$
13 Find $\mathrm{y}_{\mathrm{n}}$ where $y=\frac{x^{2}}{(x-1)^{2}(x+2)}$. CO2

14 Solve $y=\operatorname{Cos}(\log x)$
CO2
15 Find the differentiate CO3

$$
Y=\operatorname{Sin}(\operatorname{Cos} x)
$$

16 Find $y=\left(2 x^{2}+4\right)^{3}$
17 Find $y=\sin (a x+b)$

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Solve $\frac{d}{d x}\left(\frac{\sqrt{x}}{2 x+3)}\right)$
19 Find the differentiate $\tan ^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ CO1
20 Find $y_{n}$ where $y=\frac{3}{(x+1)(2 x-1)} \quad$ CO2
21 Find the $\mathrm{n}^{\text {th }}$ differential coefficients of $\cos \mathrm{x}, \cos 2 \mathrm{x}, \cos 3 \mathrm{x}$. CO2
22 Prove that if $y=\sin \left(m \sin ^{-1} x\right)$ then $\left(1-x^{2}\right) y_{2}-x y_{1}+m^{2} y=0 \quad$ CO3

## SECTION - D (Applying)

Answer any ONE Question:
23 Find the differential coefficient of $\frac{(a-x)^{2}(b-x)^{8}}{(c-2 x)^{8}}$
24 Find the Differentiate $y=x \frac{\sqrt{ }\left(a^{2}-x^{2}\right)}{2}+\frac{a^{2}}{2} \sin ^{-1}\left(\frac{x}{a}\right)$

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| Course Code: | 05CT31 | Programme: | B.Sc | CIA: | I |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 05.10 .2021 | Course: | Mathematics | Semester: | III |  |
| Duration: | 2 Hours | Year: | II |  | Max. Marks: | 50 |
| Course Title: | DIFFERENTIAL EQUATIONS |  |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The general form of the linear differential equation is $\qquad$ .
a) $\frac{d y}{d x}+P y=Q$
b) $\frac{d y}{d x}+Q y=P$
c) $\frac{d y}{d x}=Q$
d) $\frac{d y}{d x}=P$.

2 The integrating factor of the differential equation $\frac{d y}{d x}-y \cot x=2 x \sin x$ is $\qquad$ .
a) $\operatorname{cosec} x$
b) $\sin x$
c) $\sec x$
d) $\cos x$

3 The general form of Bernoulli's equation is $\qquad$ .
a) $\frac{d y}{d x}+Q y=P y^{n}$
b) $\frac{d y}{d x}+P y=Q y^{n}$
c) $\frac{d y}{d x}=Q y^{n}$
d) $\frac{d y}{d x}=P y^{n}$.

4 The roots of the differential equation $\left(D^{2}-9\right) y=0$ is $\qquad$ .

CO 2
a) 3,3
b) $3,-3$
c) $-3,-3$
d) 3, 2 .

5 The Particular integral of the differential equation $\left(D^{2}-9\right) y=\cos 3 x$ is $\qquad$ $\mathrm{CO2}$
a) $\frac{\cos 3 x}{18}$
b) $\frac{\cos 3 x}{-18}$
c) $\frac{\cos 3 x}{-9}$
d) $\frac{\cos 3 x}{9}$.

6 The Particular integral of the differential equation $\left(D^{2}-25\right) y=0$ is $\qquad$ .

CO 2
a) 1
b) 2
c) 3
d) 0 .

7 The general term of the Simultaneous differential equations of first order and first degree is
a) $\frac{d x}{P}=\frac{d y}{Q}=\frac{d z}{R}$
b) $P d x=Q d y=R d z$
c) $\frac{d x}{1}=\frac{d y}{2}=\frac{d z}{4}$
d) $\frac{d x}{3}=\frac{d y}{4}=\frac{d z}{7}$.

8 One of the solution of the differential equation $\frac{d x}{y z}=\frac{d y}{x z}=\frac{d z}{x y}$ is $\qquad$ .
a) $x^{3}-y^{3}=0$
b) $x^{4}-y^{4}=0$
c) $x^{2}-y^{2}=0$
d) $x-y=0$.

9 The general solution of the differential equation $\frac{d x}{2}=\frac{d y}{1}=\frac{d z}{4}$ is $\qquad$ .
a) $\phi(x-2 y, 4 y-z)=0$
b) $\phi(2 x-y, y-4 z)=0$
c) $\phi(x-y, y-z)=0$
d) $\phi(2 x-2 y, 4 y-4 z)=0$
$d(x y)=$ $\qquad$ -
a) $x y^{\prime}-y x^{t}$
b) $x x^{\prime}-y y^{\prime}$
c) $x y^{\prime}+y x^{\prime}$
d) $-x y^{\prime}+y x^{z}$

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Define ordinary Differential equation with example.
12 Distinguish order and degree of Differential equation. CO1
13 Find the solution of $\frac{\mathrm{d}^{2} y}{d x^{2}}+5 \frac{d y}{d x}+4 y=0$. CO2

14 Find the Particular integral of $\left(D^{2}+D+1\right) y=6$. CO2
15 Find the general solution of $\frac{\mathrm{d}^{2} y}{d x^{2}}-3 \frac{d y}{d x}+5 y=0$. CO3

16 State linear form of first order differential equation and its solution CO3
17 Solve $\frac{d x}{-y^{2}-z^{2}}=\frac{d y}{x y}=\frac{d z}{x z}$

## SECTION - C (Understanding)

Answer any THREE Questions:
18 Solve $\frac{d y}{d x}=\left(\frac{1-y^{2}}{1-x^{2}}\right)^{1 / 2}$ by variable separable method.
19 Solve $\left(a^{2}-2 x y-y^{2}\right) d x-(x+y)^{2} d y=0$.
CO1
20 Solve $\left(x^{2} D^{2}+x D+1\right) y=\log x$. CO2
21 Solve $3 x^{2} \frac{d^{3} y}{d x^{2}}+x \frac{d y}{d x}+y=x$. CO2

22 Solve $\frac{d x}{y-x z}=\frac{d y}{y z+x}=\frac{d z}{x^{2}+y^{z}}$.

23 i. Solve $\frac{d y}{d x}+y \cos x=\frac{\sin 2 x}{2}$.
ii. Solve $y^{2}+x^{2} \frac{d y}{d x}=x y \frac{d y}{d x}$.

24 Solve $(5+2 x)^{2} \frac{d^{2} y}{d x^{3}}-6(5+2 x) \frac{d y}{d x}+8 y=6 x$. CO 2

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| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05CT32 | Programme: | B.Sc | CIA: | I |
|  | Date: | 09.10 .2021 | Major: | Mathematics | Semester: | III |
|  | Duration: | 2 Hours | Year: | III | Max.Marks: | 50 |
|  | Course Title: | NUMERICAL METHODS |  |  |  |  |

SECTION - A (Remembering)
Answer ALL the Questions:
( $10 \times 1$ X 10 Marks)
1 An iteration method the condition for the convergence of the sequence to the root is
CO1
a) $\varphi(x)=c$
b) $\left|\varphi^{\prime}(x)\right|=1$
c) $\left|\varphi^{\prime}(x)\right|<1$
d) $\left|\varphi^{\prime}(x)\right|>1$

2 Gauss Jordan method is $\qquad$ method.
$\mathrm{CO1}$
a) Direct
b) Indirect
c) Interactive
d) Cubic

3 Regula - Falsi method is also known as a $\qquad$ .
a) Method of tangents
b) Method of chords
c) Method of false position
d) None
$4 \Delta\left(2^{x}\right)=$ $\qquad$ -
a) $2\left(2^{h}-1\right)$
b) $2^{x}(h-1)$
c) $2^{x}\left(2^{h}-1\right)$
d) None

5 With standard notation the correct statement is $\qquad$ CO 2
a) $\Delta=E-1$
b) $\nabla=1+E^{-1}$
c) $D=h \log E$
d) None

6 With standard notation the correct statement is $\qquad$ .
a) $\Delta-\nabla=\delta^{2}$
b) $\Delta+\nabla=\Delta \in$
c) $\Delta+\nabla=\delta^{2}$
d) None
$7 \Delta \nabla=$ $\qquad$ .

CO
a) $\delta$
b) $\delta^{2}$
c) 0
d) None
$8 \frac{E^{1 / 2}+E^{-1 / 2}}{2}=$ $\qquad$ .
a) $\mu$
b) $\delta$
c) D
d) None
$9 e^{h D}=$ $\qquad$ .
a) $E^{-1}$
b) $E$
c) $\Delta$
d) None
$10 \quad E^{M} E^{n}=$ $\qquad$ .
a) $E^{m / n}$
b) $E^{m+n}$
c) $E^{m-n}$
d) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X $2=10$ Marks)
11 Define algebraic equation. CO1
12 Write Newton's Raphson formula to obtain cube root of N. CO1
13 Find the $n^{\text {th }}$ difference of $e^{x}$. CO2
14 Prove that $E=1+\Delta$. CO2
15 Find the order and degree of $y_{n+2}-y_{n+1}+y_{n}=0 . \quad \mathbf{C O 3}$
16 Find the difference equation by eliminating the constant a from $y_{n}=a 3^{n}$.
CO3
17 Solve $y_{n+2}-3 y_{n+1}+2 y_{n}=0$. CO3

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Use Aitken's $\Delta^{2}$ method to find the real root lying between 1 and 2 of the CO1 equation $x^{3}-3 x+1=0$.
19 Solve the following system of equation of equations by Gauss Jordan method CO1 $x+y+z=9 ; 2 x-3 y+4 z=13 ; 3 x+4 y+5 z=40$.
20 Prove that $\Delta \tan ^{-1}\left(\frac{n-1}{n}\right)=\tan ^{-1}\left(\frac{1}{2 n^{2}}\right)$. CO2

21 Prove that $\frac{1}{2} \delta^{2}+\delta \sqrt{1+\frac{\delta^{3}}{4}}=\delta$. Given $u_{0}=2, u_{1}=11, u_{2}=80, u_{3}=200, u_{4}=100, \quad u_{5}=8$, find $\nabla^{5} u_{5}$ CO without constructing the differenc table.

## SECTION - D (Applying)

Answer any ONE Question:
(1X 12= 12 Marks)
23 Solve the following system of the equations using Gauss Seidel iteration method CO1 $6 x+15 y+2 z=72 ; x+y+54 z=110 ; 27 x+6 y-z=85$
24 Solve the difference equation CO2 $u_{n+2}+u_{n+1}+u_{n}=n^{2}+n+1$.

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| :---: | :---: | :---: | :---: | :---: | :---: |
| Course Code: | 05CT51 | Programme: | B.Sc | CIA: | I |
| Date: | 14.09.2021 | Major: | Mathematics | Semester: | V |
| Duration: | 2 Hours | Year: | III | Max.Marks: | 50 |
| Course Title: | STATISTICS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The correlation coefficient is independent of the change of $\qquad$ -.

CO1
(A) Origin \& Scale
(B) Scale
(C) Origin or Scale
(D)None

2 Correlation coefficient is the $\qquad$ between the regression coefficients.

CO1
(A) Mean
(B) A.M
(C) G.M
(D)None

3 If the two variables deviate in the opposite direction, the correlation is said to be ()
(A) Perfect
(B) direct
(C) inverse
(D) None

4 If $\mathrm{u}=\mathrm{x}+\mathrm{y}$ then $\bar{u}=$ $\qquad$ .

CO 2
(A) $\bar{x} \bar{y}$
(B) $\bar{x}-\bar{y}$
(C) $\bar{x}+\bar{y}$
(D) None

5
$---=\frac{P(A \cap B)}{P(B)}$
(A) $P(A \cup B)$
(B) $P(B \mid A)$
(C) $P(A \mid B)$
(D)None

6 If $\mathrm{F}(\mathrm{x})$ is a distribution function and if $\mathrm{a}<\mathrm{b}$ then $\mathrm{P}(\mathrm{a}<\mathrm{X}<\mathrm{b})$ is
CO 2
(A) $\mathrm{F}(\mathrm{b})+\mathrm{F}(\mathrm{a})$
(B) $\mathrm{F}(\mathrm{a})-\mathrm{F}(\mathrm{b})$
(C) $\mathrm{F}(\mathrm{b})-\mathrm{F}(\mathrm{a})$
(D) None

7 The probability function $P(X=x)=n C_{x} p^{x} q^{n-x}$ is $\qquad$ distribution.
(A) Normal
(B) Poisson
(C) Binomial
(D) None

8 If X is a binomial distribution with parameters
CO
(A) n\& p
(B) n \& q
(C) $\mathrm{p} \& \mathrm{q}$
(D)None

9 The M.G.F of a binomial distribution about the origin
(A) $\left(p+q e^{t}\right)^{n}$
(B) $\left(q+p e^{-t}\right)^{n}$
(C) $\left(q+p e^{t}\right)^{n}$
(D)None

10 If $X$ is a $B(n, p)$, then the mean value is
(A) npq
(B) nq
(C) np
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Correlation coefficient is the geometric mean between the regression coefficient CO1
$\gamma= \pm \sqrt{b_{x y} b_{y x}}$
12 If one of the regression coefficients is greater than unity the other is less than unity
CO1
13 Prove that $A$ and $B$ are independent events then $\bar{A}$ and $\bar{B}$ are also independent event. $\mathbf{C O 2}$
14 Define mathematical expectation for continuous random variable. $\mathbf{C O 2}$
15 Define binomial distribution. $\mathbf{C O 3}$
16 Compute the mode of a binomial distribution $\mathrm{B}(7,1 / 4)$. $\mathbf{C O 3}$
17 In a binomial distribution the mean is 4 and the variance is $8 / 3$. Find the mode of the $\mathbf{C O} 3$ distribution.

> SECTION - C (Understanding)

Answer any THREE Questions:
18 Find the correlation coefficient for the following date

| Marks in Maths | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Marks in Statistics | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

19 From the following data of marks obtained by 10 students in physics and chemistry calculated the rank correlation coefficient

| Physics(P) | 35 | 56 | 50 | 65 | 44 | 38 | 44 | 50 | 15 | 26 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Chemistry(C) | 50 | 35 | 70 | 25 | 35 | 58 | 75 | 60 | 55 | 35 |

20 State and Prove Boole's inequality.
21 An insurance agent accepts policies of 5 men all of identical age and good health. The probability that a man of this age will be alive 30 years hence is $2 / 3$. Find the probability that in 30 years (i) all five men (ii) at least one man (iii) at most three will be alive.
22 An insurance agent accepts policies of 5 men all of identical age and good health. The probability that a man of this age will be alive 30 years hence is $2 / 3$. Find the probability that in 30 years (i) all five men (ii) at least one man (iii) at most three will be alive.

SECTION - D (Applying)
Answer any ONE Question:
23 The two variables $x$ and $y$ have the regression lines $3 x+2 y-26=0$ and $6 x+y-31=0$.
(i) Find the mean values of $x$ and $y$.
(ii) Find the correlation coefficient between $x$ and $y$.
(iii) Find the variance of $y$ if the variance of $x$ is 25 .

24 Obtain the (i) Mean (ii) Median (iii) Mode for the following distribution

$$
f(x)= \begin{cases}6\left(x-x^{2}\right) & \text { if } 0<x<1 \\ 0 & \text { otherwise } .\end{cases}
$$

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DEPARTMENT OF MATHEMATICS

| Course Code: | 05CT52 | Programme: | B.Sc | CIA: |  | I |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 15.09 .2021 | Course: | Mathematics | Semester: | V |  |
| Duration: | 2 hours | Year: | III |  | Max. Marks: | 50 |
| Course Title: | MODERN ALGEBRA |  |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( 10 X 1 = 10 Marks)
1 Let $\mathrm{A}=\{$ blood,sky $\}, \mathrm{B}=\{$ red,blue,green $\}$. Define a relation $\rho$ from A to $\mathrm{a} \rho \mathrm{b} \Leftrightarrow$ the colour of $\mathbf{C O 1}$ a is b . Then $\rho=$ ?
a) $\{$ (blood,blue),(blood,red) $\}$
b) $\{$ (blood,red),(sky,blue) $\}$
c) $\{($ red,blood $),($ blue,sky $)\}$
d) $\{$ (blood,red),(blood,blue),(blood,green) $\}$

2 The relation $\rho$ defined on $Z$ by a $\rho b \Leftrightarrow a b$ is odd, Then $\rho$ is $\qquad$ .
a) reflexive and symmetric
b) reflexive but not symmetric
c) symmetric but not reflexive
d) neither reflexive nor symmetric

3 The function $f: \mathrm{R} \rightarrow \mathrm{R}$ is $\qquad$ .
a) Bijection
b) 1-1 but not onto
c) Not 1-1 but onto
d) Neither 1-1 nor onto

4 An element a is called idempotent if $\qquad$ .
c) $a=a^{-1}$
d) $\mathrm{a}=2$.

5 Which one of the following is a group?
a) the set of all even integer under addition
b) the set of all even integer under subtraction
c) the set of all odd integer under addition
d) the set of all odd integer under subtraction

6 The symmetric group of order n is $\qquad$ .
a) a non-abelian group for any $n$
b) an abelian group for all $n$
c) non-abelian group only when $\mathrm{n} \geq 3$
d) abelian group for $\mathrm{n}=3$

7 The order of -i in $\left(\mathrm{C}^{*},.\right)$ is $\qquad$ .
a) 1
b) 2
c) 4
d) infinite

8 The incorrect answer from the following choices is $\qquad$ .
(a) $(\mathrm{N},+)$ is an abelian group
(b) $(\mathrm{Z},+)$ is an abelian group
(c) $(\mathrm{Q},+)$ is an abelian group
(d) $(\mathrm{R},+$ ) is an abelian group

9 Which one of the following is a group?
The order of an element a in a group $G$ with the identity elements $e$ is $\qquad$ .
a) an integer $n$ such that $a^{n}=e \quad$ b) a positive integer $n$ such that $a^{n}=e$.
c) the least positive integer $n$ such that $\mathrm{a}^{\mathrm{n}}=e$.
d) the least positive integer $n$ such that $a^{n}=a$.

10 The order of the element -1 in $(\mathrm{Z},+)$ is $\qquad$ ـ.

CO 3
a) 2
b) infinite
c) 1
d) -1 .

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Define Reflexive.
13 Define abelian group.

## SECTION - C (Understanding)

18 If $\rho$ and $\sigma$ are equivalence relations defined on a set $S$, prove that $\rho \cap \sigma$ is an equivalence $\mathbf{C O 1}$ relation.
19 Verify (hog) $f=h \mathrm{o}(g \circ f)$, where $f: \mathrm{N} \rightarrow \mathrm{Z}$ is given by $f(\mathrm{x})=5-3 \mathrm{x}, g: \mathrm{Z} \rightarrow \mathrm{R}^{+}$is given by
20 Prove that $A$ non empty subset $H$ of a group $G$ is a subgroup of $G$ iff $a, b \in H \Rightarrow a^{-1} \in H$. CO2

21 Evaluate C* is a group under usual multiplication given by $(a+i b)(c+i d)=(a c-b d)+$ $i(a d+b c)$.
22 Let $G$ be group and a be an element of order n in G . Then prove that $\mathrm{a}^{\mathrm{m}}=\mathrm{e}$ iff n divides m.

## SECTION - D (Applying)

Answer any ONE Question:
23 i) If $f: \mathrm{A} \rightarrow \mathrm{B}$ and $g: \mathrm{B} \rightarrow \mathrm{C}$ are bijections then show that $(g \circ f)^{-1}=f^{1} \circ g^{-1}$.
ii) If $S=Z$ and $a \rho b$ means $a \equiv b(\bmod m)$. Then show that $\rho$ is an equivalence relation.
24 i) If H and K are sub groups of a group G then prove that $\mathrm{H} \cap \mathrm{K}$ is also a subgroup of G . $\mathbf{C O 2}$
ii) Show that any permutation can be expressed as a product of disjoint cycles.

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DEPARTMENT OF MATHEMATICS

| Course Code: | 05CT53 | Programme: | B.SC. |  | CIA: | I |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 16.09 .2021 | Major: | Mathematics | Semester: | V |  |
| Duration: | 2 Hours | Year: | III |  | Max.Marks: | 50 |
| Course Title: | REAL ANANLYSIS |  |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 In $\mathbf{R}$ with usual metric the open ball $\mathrm{B}(-1,1)$ is $\qquad$ CO1
(A) $[-2,0]$
(B) $[-2,0)$
(C) $[-1,1)$
(D)(-2,0)

2 In [0,1] with usual metric open ball $\mathrm{B}(0,1 / 4)$ is defined as $\qquad$ CO1
(A) $(-1 / 4,1 / 4)$
(B) $[0,1 / 4)$
(C) $(-1 / 4,0)$
(D) $(0,1 / 4)$

3 If M is a discrete metric space then $\mathrm{B}(\mathrm{a}, 2)=$ $\qquad$ CO1
(A) $\{a\}$
(B) M
(C) $\Phi$
(D) 2

4 In $\mathbf{R}$ with usual metric the incorrect statement is $\qquad$ CO 2
(A)any open interval (a,b) is an open set
(B) $(-\infty, a)$ is an open set
(C) $(\mathrm{a}, \infty)$ is an open set
(D) $\{0\}$ is an open set

5 In $\mathbf{R}$ with usual metric the correct statement is $\qquad$ CO 2
(A) $[0,1)$ is an open set
(B) $(0,1)$ is an open set
(C) $\mathbf{Q}$ is open
(D) $\mathrm{Zis}_{\text {is open }}$

6 The incorrect statement is $\qquad$ CO 2
(A) $\mathbf{R}$ with usual metric is complete
(B) $\mathbf{C}$ with usual metric is complete
(C) $\mathbf{Q}$ with usual metric is complete
(D) Discrete metric is complete

7 The incorrect statement is
(A) Every subset of a complete metric space is complete
(B) A subset A of a complete metric space is complete iff A is closed
(C) $\mathbf{Q}$ is not complete
(D) $\mathbf{R}$ is complete

8 The incorrect statement is $\qquad$
$\begin{array}{ll}\text { (A) In } \mathbf{R} \text { with usual metric every singleton set is closed } & \text { (B) } \mathbf{Q} \text { is closed in } \mathbf{R}\end{array}$
(C) Every subset of a discrete metric space is closed
(D)In any metric space every closed ball is a closed set

9 The incorrect statement is $\qquad$ .
(A) In $\mathbf{R}$ with usual metric any closed interval is a closed set
(B) $\mathbf{Q}$ is not closed in $\mathbf{R}$
(C) Every closed ball in $\mathbf{R}$ is closed
(D)The set of irrational numbers is closed in $\mathbf{R}$

10 In any metric space the incorrect statements is
(A) Arbitrary intersection of closed sets is a closed set
(B) the union of a finite number of closed sets is closed
(C) The intersection of any family of open sets is open
(D)the union of any family of open sets is open.

## SECTION - B (Remembering)

Answer any FIVE Questions:
12 Define bounded set with example.
13 Prove that A is closed iff $\mathrm{A}=\bar{A}$.
14 Define dense set. CO2
15 Define homomorphism. CO3
16 Let $M=[12] \cup[3,4]$ with usual metric prove $M$ is disconnected. $\mathbf{C O 3}$
17 Define complete metric space. CO3
SECTION - C (Understanding)
Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Prove that a subset of a countable set is countable. CO1
19 Let $(\mathrm{M}, \mathrm{d})$ be a metric space and $d_{1}(x, y)=\min \{1, d(x, y)\}$ Prove that $\mathrm{d}_{1}$ is metric on M. CO1
20 Prove that $\mathrm{x}_{\mathrm{n}}$ any matric space arbitrary Intersection of closed set is closed.

21 Let (M,d) be metric space let A,B C M. Prove that
(i) int $(A \cap B)=$ int $A \cap$ int $B$
(II) $A \underline{C} B=\operatorname{int} A \underline{C}$ int $B$

22 Let ( $\mathrm{M}, \mathrm{d}$ ) be metric space. Prove that any convergent sequence in M is a Cauchy sequence. CO3 SECTION - D (Applying)
Answer any ONE Question:
(1X 12= 12 Marks)
23 State and prove Miniknowis Inequality
CO1
24 Let $M$ be a metric space and $M_{1}$ be a subspace of $M$. Let $A_{1}$ be a subset of $M_{1}$. Then prove $\mathbf{C O 2}$ that $A_{1}$ is open in $M_{1}$ iff there exists an open set $A$ in $M$ such that $A_{1}=A \cap M$.

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DEPARTMENT OF MATHEMATICS

| Course Code: | 05CT54 | Programme: | B.Sc |  | CIA: | I |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 17.09 .2021 | Major: | Mathematics | Semester: | V |  |
| Duration: | 2 Hours | Year: | 2021 |  | Max.Marks: | 50 |
| Course Title: | STATICS |  |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 Two forces P and Q act at a point at an angle $\alpha$. Then maximum value of the resultant is $\mathbf{C O 1}$
$\qquad$ -.
(a) P-Q
(b) $P+Q$
(c) P/Q
(d) None

2 If the resultant of two forces acting at a point with magnitude 3,5 is a force with
CO1 magnitude 7 , then the angle between them is $\qquad$ .
(a) $30^{0}$
(b) $45^{\circ}$
(c) $60^{0}$
(d) $90^{\circ}$

3 If the forces P and Q are at right angles to each other their resultant is $\mathrm{R}=$ $\qquad$ .
(a) $P^{2}+Q^{2}$
(b) $P^{2}-Q^{2}$
(c) $\sqrt{P^{2}+Q^{2}}$
(d) None

4 The magnitude of the resultant of two unlike parallel forces is their $\qquad$ .

CO 2
(a) Difference
(b) sum
(c) product
(d) None

5 The resultant of two unlike and unequal parallel forces act near the $\qquad$ force.

CO 2
(a) Smaller
(b) greater
(c) equal
(d) None

6 The moment of a force about a point is a $\qquad$ quantity.

CO2
(a) Vector
(b) scalar
(c) greater
(d) None

7 If three coplanar forces acting on a rigid body keep it in equilibrium, they must be $\qquad$ or be parallel.
(a) Two of them parallel
(b) concurrent
(c) non concurrent
(d) None

8 A couple and a $\qquad$ can never be in equilibrium.

CO 3
(a) Couple
(b) Force
(c) moment
(d) None

9 When the body is leaning against a smooth surface, the reaction on the body is $\qquad$ tc $\mathbf{C O 3}$ surface.
(a) Parallel
(b) normal
(c) making an angle
(d)None

10 The $\qquad$ of the body acts vertically downwards through its center of gravity.
(a) Mass
(b) weight
(c) shape
(d) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Find the magnitude of the resultant if the two forces are equal. $\mathbf{C O 1}$
12 State the triangle law of forces. $\mathbf{C O 1}$
13 Define moment of a force. CO2
14 State the condition of equilibrium of three coplanar forces. $\mathbf{C O 2}$
15 Define couple. CO3
16 Define coplanar forces. $\mathbf{C O 3}$
17 Write two equivalent couple for $\left(F, \frac{P p}{F}\right)$. $\mathbf{C O 3}$

## SECTION - C (Understanding)

Answer any THREE Questions:
18 State and prove Lami's theorem. CO1
19 The resultant of two forces $P, Q$ acting at a certain angle is $X$ and that of $P$ and $R$ acting at $\mathbf{C O 1}$ the same angle is also X . The resultant of $\mathrm{Q}, \mathrm{R}$ again acting at the same angle is Y. Prove that.

$$
P=\left(X^{2}+Q R\right)^{\frac{1}{2}}=\frac{Q R(Q+R)}{Q^{2}+R^{2}-Y^{2}}
$$

Prove also that, if $\mathrm{P}+\mathrm{Q}+\mathrm{R}=0, \mathrm{Y}=\mathrm{X}$.

20 Find the resultant of two like parallel forces.
21 Two men, one stronger than the other, have to remove a block of stone weighing 300 kgs , with a light pole whose length is 6 meter. The weaker man cannot carry more than 100kgs. Where the stone must be fastened to the pole, so as just to allow him his full share of weight?
22 State and prove any one of the two trigonometrical theorems.

## SECTION - D (Applying)

Answer any ONE Question:
(1X 12= 12 Marks)
23 ABC is a given triangle. Forces $\mathrm{P}, \mathrm{Q}, \mathrm{R}$ acting along the lines $\mathrm{OA}, \mathrm{OB}, \mathrm{OC}$ are in CO1 equilibrium. Prove that
(i) $\mathrm{P}: \mathrm{Q}: \mathrm{R}=a^{2}\left(b^{2}+c^{2}-a^{2}\right): b^{2}\left(c^{2}+a^{2}-b^{2}\right): c^{2}\left(a^{2}+b^{2}-c^{2}\right)$ if O is the cicumcentre of the triangle.
(ii) $\mathrm{P}: \mathrm{Q}: \mathrm{R}=\cos \frac{A}{2}: \cos \frac{B}{2}: \cos \frac{C}{2}$ if O is the incentre of the triangle.
(iii) $\mathrm{P}: \mathrm{Q}: \mathrm{R}=\mathrm{a}: \mathrm{b}: \mathrm{c}$ if O is the orthocentre of the triangle.

24 State and prove Varigon's theorem.

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| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05EP5A | Programme: | B.Sc | CIA: | I |
|  | Date: | 18.09.2021 | Major: | Mathematics | Semester: | V |
|  | Duration: | 2 HOURS | Year: | III | Max. Marks: | 50 |
|  | Course Title: | LINEAR PROGRAMMING |  |  |  |  |

## SECTION - A

1 A constraint in an LPP restricts
a) Value of objective function
b) Value of a decision variable
c) Use of available resource
d) Uncertainty of optimum value.

2 Minimization of objective function in LPP means
a) Least value chosen among the allowable decisions
b) Greatest value chosen among the allowable decisions
c) Both a) and b)
d) None of the above.

3 The general Linear Programming Problem is in standard form, if
a) the constraints are strict equations
b) the constraints are inequalities of ${ }^{\prime} \leq{ }^{\prime}$ type
c) the constraints are inequalities of ${ }^{\prime} \geq^{\prime}$ type
d) the decision variables are unrestricted sign.

4 A constraint in an LPP is expressed as
a) an equation with ${ }^{\prime}={ }^{\prime}$ sign
b) inequalities with ' $\leq^{\prime}$ sign
c) inequalities with ${ }^{\prime} \geq$ 'sign
d) any one of the above

5 Given a system of $m$ simultaneous linear equations in $n$ unknowns ( $m<n$ ), the number of basic variables will be
a) $m$
b) $n$
c) $n-m$
d) $n+m$

6 For a maximization linear programming problem, the simplex method is terminated when all the net-evaluations are
a) negative
b) zero
c) non-negative
d) positive

7 If a negative value appears in the solution values $\left(x_{B}\right)$ column of the simplex method, then
a) the basic solution is optimum
b) the basic solution is infeasible
c) the basic solution is unbounded
d) all of the above

8 If an optimum solution is degenerate, then
CO
a) The solution is infeasible
b) there are alternative optimum solution
c) the solution is of no use to the decision maker
d) none of the above

9 A basic solution to the system is called $\qquad$ if one or more of the basic variables vanish
a) Infeasible
b) Degenerate
c) Non-degenerate
d) Unbounded

10 The vector $c_{B}$ is called $\qquad$ associated with the basic feasible solution $x_{B}$
a) Associated vector
b) Basic vector
c) Cost vector
d) none of them

## SECTION - B

Answer any FIVE Questions:
11 Give an example of mathematical form of a linear programming problem? CO1
12 Define the canonical form in LPP? CO1
13 Define basic feasible solution to the LPP? CO2
14 Define unbounded solution to the LPP? CO2
15 Define Dual problem in Linear Programming problem? CO3
16 Define Primal problem in Matrix form? CO3
17 Define Dual problem in Matrix form? $\mathbf{C O 3}$

## SECTION - C

Answer any THREE Questions:
18 What are the characteristics of the canonical form of LPP?
19 Solve the given LPP by using graphical solution method.
Maximize $z=3 x_{1}+2 x_{2} \quad$ Subject to the constraints:

$$
2 x_{1}+x_{2} \leq 100, x_{1}+x_{2} \leq 80, x_{1} \leq 40 ; x_{1}, x_{2} \geq 0
$$

20 State and prove the fundamental theorem of linear programming?
CO2
21 Write short notes about simplex algorithm? CO2
22 Write the dual of the LPP:
Minimize $z=4 x_{1}+6 x_{2}+18 x_{3}$; Subject to the constraints:

$$
x_{1}+3 x_{2} \geq 3, \quad x_{2}+2 x_{3} \geq 5, \quad x_{i} \geq 0, \quad(i=1,2,3)
$$

## SECTION - D

Answer any ONE Question:
23 Transform the given LPP into the form where all the constraints are of equality type: CO1
Maximize $z=2 x_{1}+x_{2}-5 x_{3}+3 x_{4} \quad$ Subject to the constraints:

$$
\begin{aligned}
& 3 x_{1}+2 x_{2} \leq 15, \quad 4 x_{1}+5 x_{2} \geq 20, \quad x_{1}+x_{2}-x_{3}+2 x_{4}=10, \\
& 2 \leq 2 x_{1}+4 x_{2}-x_{3} \leq 30 ; x_{i} \geq 0, \quad(i=1,2,3,4) .
\end{aligned}
$$

24 Using simplex method to solve the given LPP
Maximize $z=4 x_{1}+10 x_{2}$; Subject to the constraints:

$$
2 x_{1}+x_{2} \leq 50, \quad 2 x_{1}+5 x_{2} \leq 100, \quad 2 x_{1}+3 x_{2} \leq 90 ; x_{1}, x_{2} \geq 0
$$

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| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05SB31 | Programme: | B.Sc | CIA: | I |
|  | Date: | 04.10 .2021 | Major: | Mathematics | Semester: | III |
|  | Duration: | 1 Hour | Year: | II | Max.Marks: | 25 |
|  | Course Title: | MATHEMATICAL LOGIC |  |  |  |  |

SECTION - A
Answer ALL the Questions:
(5 X $1=5$ Marks)
$1 \mathrm{P}^{\vee} 1=$
a) 1 b) 0 c) 7 d) none of these
$2 \mathrm{P}^{\wedge} 0=$
a) 0
b) 1
c) $\infty$
d) none of these

3 P $\sim \mathrm{P}=$
b) 0 c) -1
d) none of these
$4 \mathrm{P}^{\vee} \mathrm{P}=$
$\begin{array}{ll}\text { c) } 0 & \text { d) } 1\end{array}$
$5 \mathrm{p} \rightarrow \mathrm{q}=$
b) $Q$
a) $\sim p^{\vee} p$ b) $\sim p^{\vee} q$ c) $p^{\wedge} q^{d} d p^{\vee} q$

SECTION - B
Answer any TWO Questions:
(2 X $2=4$ Marks)
6 Write the Conditional statement.
CO1
7 Write the distributive law CO2
8 Define proposition. CO2
9 Write the De Morgan's law $\mathbf{C O 3}$
SECTION - C
Answer any ONE Question:
10 Write the truth table

11 Write the truth table
I. $\quad(\mathrm{p} \wedge \mathrm{q}) \wedge \mathrm{r}$
II. $\quad(\sim p)^{\vee}(\sim q)$
III. $\quad p^{\wedge}(\sim q) \rightarrow \sim\left(\sim p^{\vee} q\right)$
IV. $\sim\left(\sim p^{\vee} q\right)$

## SECTION - D

Answer any ONE Question:
12 Given the truth table

$$
\left(p^{\vee} q\right)^{\mathrm{V}}\left(\mathrm{r}^{\vee} \mathrm{s}\right)
$$

13 Construct the truth table
$\left(p^{\wedge} q\right)^{\vee}\left(q^{\wedge} r\right)^{\vee}\left(r^{\wedge} p\right)$

| Course Code: | 05SB51 | Programme: | B.Sc |  | CIA: | I |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 13.09.21 | Major: | Mathematics | Semester: | V |  |
| Duration: | 1 Hour | Year: | III |  | Max. Marks: | 25 |
| Course Title: | QUANTITATIVE APTITUDE |  |  |  |  |  |

## SECTION - A

Answer ALL the Questions:
(5 X $1=5$ Marks)
1 If A can do a piece of work in n days, then A's one day's work is $\qquad$ .

CO1
(a) $\mathrm{n}-1$
(b) $\mathrm{n}+1$
(c) $1 / n$
(d) $1 /(\mathrm{n}+1)$

2 If A can complete a piece of work in 12 days and B is twice as A, then B can complete the
CO 1 same work in $\qquad$ days.
(a) 12
(b) 6
(c) 3
(d) 24

3 An average speed of two person $A \& B$, if they travel $x$ kmph\& $y$ kmph for the same $\mathbf{C O 2}$ distance is $\qquad$ .
(a) $(x+y) / 2$
(b) $\quad(x-y) / 2$
(c) $\quad(x+y) / 2 x y$
(d) $2 x y /(x+y)$

4 If A takes 4 hrs for travel 400 meters then his speed is $\qquad$ .
$\mathrm{CO2}$
(a) $50 \mathrm{~km} / \mathrm{h}$
(b) $75 \mathrm{~km} / \mathrm{h}$
(c) $100 \mathrm{~km} / \mathrm{h}$
(d) $125 \mathrm{~km} / \mathrm{h}$

5 Which of the following trains is the fastest?
(a) $25 \mathrm{~m} / \mathrm{s}$
(b) $1500 \mathrm{~m} / \mathrm{s}$
(c) $90 \mathrm{~km} / \mathrm{hr}$
(d) $30 \mathrm{~km} / \mathrm{hr}$

SECTION - B
Answer any TWO Questions:
(2 X $2=4$ Marks)
6 A and B together can complete a piece of work in 4 days. If A alone can complete the
same work in 12 days; in how many days B alone complete that work?
7 At what rate of percent per annum will a sum of money double in 16 years?
CO2
8 A is twice as good as B and together they finish a piece of work in 18 days. In how many
CO2 days will A alone finish the work?
9 I walk certain distance and ride back taking a total time of 37 minutes. I could walk both
CO ways in 55 minutes. How long would it take me to ride both ways?

## SECTION - C

Answer any ONE Questions:
(1 X 6= 6 Marks)
10 An Aero plane flies along the four sides of a square at a speeds of $200,400,600 \& 800 \mathrm{~km} / \mathrm{h}$ respectively. Find the average speed of the plane around the field?
11 Walking at $\frac{5}{6}$ of its usual speed, a train is 10 minutes late. Find its usual time to cover the $\mathbf{C O 2}$ journey?

## SECTION - D

Answer any ONE Question:
( $1 \times 10=10$ Marks)
122 men and 3 boys can do a piece of work in 10 days while 3 men and 2 boys can do the CO1 same in 8 days. In how many days can 2 men and 1 boy do the work?
13 A thief is spotted by a police man from a distance of 100 meters. When the police man
CO 2 starts the chase, the thief also starts running. If the speed of the thief is $8 \mathrm{~km} / \mathrm{hr}$ and that of the police man $10 \mathrm{~km} / \mathrm{hr}$, how far the thief will have run before he is overtaken?

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|  | Course Code: | 05AT01 | Programme: | B.Sc | CIA: | II |
|  | Date: | 24.11.2021 | Major: | Physics/ Chemistry | Semester: | III |
|  | Duration: | 2 Hours | Year: | II | Max. Marks: | 50 |
|  | Course Title: | MATHEMATICS - I |  |  |  |  |

SECTION - A (Remembering)
Answer ALL the Questions:
(10 X 1 = 10 Marks)
1
The value of $\int \frac{1}{x \sqrt{x^{2}-1}} d x$ is $\qquad$ -
(a) $\operatorname{cosec}^{-1} x$
(b) $\sec ^{-1} \mathrm{x}$
(c) $\cot ^{-1} \mathrm{x}$
(d) $\tan ^{-1} x$

2 The value of $\int \frac{1}{x} d x$ is $\qquad$ .
(a) $-\log x$
(b) $1 / \log x$
(c) $\log x$
(d) $-1 / \log x$

3 The value of $\int \sec ^{2} x d x$ is $\qquad$ .
(a) $-\tan x$
(b) $\tan x$
(c) $\sec x \tan x$
(d) $-\sec x \tan x$

4 The value of $\int \sinh x d x$ is $\qquad$ .
(a) $-\cosh x$
(b) $\cosh x$
(c) $\operatorname{cosech} x$
(d) $-\operatorname{cosech} x$

5 . The vectors $\vec{a} \& \vec{b}$ are parallel if $\vec{a} \times \vec{b}=$ $\qquad$ -
(a) 0
(b) 1
(c) non zero
(d) -1

6 If $\vec{f}$ is solenoidal, then $\nabla \cdot \vec{f}$ is $\qquad$ .

CO 3
(a) 1
(b) 2
(c) 0
(d) -1

7 If $\varphi(x, y, z)=x^{2} y z^{3}+20$, then $\varphi$ at $(1,1,1)$ is $\qquad$ .

CO
(a) 20
(b) 21
(c) 22
(d) 23

8 The value of $\int \frac{1}{1+x^{2}} d x$ is $\qquad$ .

CO 4
(a) $\tan ^{-1} \mathrm{x}$
(b) $\cos ^{-1} \mathrm{x}$
(c) $\sin ^{-1} x$
(d) $\cot ^{-1} \mathrm{x}$

9 The value of $\int \sin x d x$ is $\qquad$ -
(a) $\cos x$
(b) $\cos ^{2} x$
(c) $-\cos x$
(d) $-\cos ^{2} \mathrm{x}$

10 The value of $\int x^{n} d x$ is $\qquad$ -.
(b) $x^{n+1} / n$
(c) $x^{n} / n+1$
(d) $x^{n} / n$

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Evaluate $\mathrm{I}=\int_{0}^{1} \int_{0}^{2} \mathrm{xy}^{2} d y d x$.
12 Find I , where $\mathrm{I}=\int_{0}^{\pi} \int_{0}^{\text {acos } \theta} \mathrm{r} \sin \theta \mathrm{d} \mathrm{rd} \theta$.
13 Evaluate $I=\int_{0}^{\log a} \int_{0}^{x} \int_{0}^{x+y} e^{x+y+z} d z d y d x$.
14 Define irrotational.
CO4
15 Let $r=x i+y j+z k$, find div $r$ and curl $r$.
16 If $\mathrm{f}=(2 \mathrm{y}+3) \mathrm{i}+\mathrm{xzj}+(\mathrm{yz}-\mathrm{x}) \mathrm{k}$, evaluate $\int_{\mathrm{c}} \mathrm{f}$. dr along the following path C as $\mathrm{x}=2 \mathrm{t}^{2}$,
CO5 $y=t$ and $z=t^{3}$ from $t=0$ and $t=1$.
17 Define Line integral.
$\mathrm{CO5}$

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6=18 Marks)
18 Evaluate $\mathrm{I}=\int_{0}^{\mathrm{a}} \int_{0}^{\mathrm{x}} \int_{0}^{\mathrm{y}} \mathrm{xyz} \mathrm{dzdydx}$. $\mathbf{C O 3}$
19 If $r$ is the position vector of any point $P(x, y, z)$, prove that $\operatorname{grad} r^{n}=n r^{n-2} \vec{r}$. CO4
20 Show that $\operatorname{div}\left(\frac{\vec{r}}{\mathrm{r}}\right)=\frac{2}{\mathrm{r}}$.

Evaluate $\int_{C}$ f.dr where $f=\left(x^{2}+y^{2}\right) i+\left(x^{2}-y^{2}\right) j$ and $C$ is the curve $y=x^{2}$ joining $(0,0)$ and $(1,1)$.
Evaluate $\iint_{\mathrm{s}}$ f.n ds where $\mathrm{f}=\left(\mathrm{x}^{2}+\mathrm{y}^{2}\right) \mathrm{i}-2 \mathrm{xj}+2 \mathrm{yzk}$ and S is the surface of the plane 2 x $+y+2 z=6$ in the first octant.

## SECTION - D (Applying)

Answer any ONE Question:
23 Prove that $\operatorname{div}\left(r^{n} r\right)=(n+3) r^{n}$ and deduce that $r^{n} r$ is solenoidal iff $n=-3$.
24 Verify Gauss divergence theorem for the vector function $f=\left(\mathrm{x}^{2}-\mathrm{yz}\right) \mathrm{i}-2 \mathrm{x}^{2} \mathrm{yj}+2 \mathrm{k}$ over the CO5 cube bounded by $\mathrm{x}=0, \mathrm{y}=0$ and $\mathrm{z}=0, \mathrm{x}=\mathrm{a}, \mathrm{y}=\mathrm{a}$ and $\mathrm{z}=\mathrm{a}$.

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| Course Code: | O5AT31 | Programme: | B.Sc |  | CIA: | II |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Date: | 24.11 .2021 | Major: | Mathematics | Semester: | III |  |
| Duration: | 2 Hours | Year: | II |  | Max. Marks: | 50 |
| Course Title: | PROGRAMMING IN C |  |  |  |  |  |

## SECTION - A

Answer ALL the Questions:

1 The variable which has been declared before the main is called
( 10 X 1 = 10 Marks)
$\qquad$ variable.
a) local
b) global
c) static
d) auto
2 The function $\operatorname{strcpy}(\mathrm{s} 1, \mathrm{~s} 2)$ in string.h $\qquad$ .
a) Copies s1 to s2.
b) Copies s2 to s1.
c) Appends $s 1$ to end of $s 2$.
d) Appends s2 to end of $s 1$.
3 Which is valid string function?
a) $\operatorname{strpbrk}()$
b) strlen()
c) $\operatorname{strxfrm}()$
d) $\operatorname{strcut}()$
4 The operator \& is used for
a) Bitwise AND
b) Bitwise OR
c) Logical AND
d) Logical OR
5 Structure is a $\qquad$ .
a) scalar data type
b) derived data type
c) both a and b
d) primitive data type
6 All keywords must be written in $\qquad$ .
a) upper case
b) lower case
c) within codes
d) separately
7 The operators exclusively used in connection with pointers are $\qquad$ .
a) *
b) \&
c) $\cdot$
d) Both (a) \& (b)
8 Pointer variable may be assigned $\qquad$ .
a) an address value represented in hexadecimal
b) an address value represented in octal
c) the address of another variable
d) an address value represented in binary CO3

## CO 3

CO
CO

9 The number of the relational operators in the C language is
$\mathrm{CO5}$
a) Four
b) $\operatorname{Six}$
c) Three
d) One

10 The function fopen() on failure returns _.
$\mathrm{CO5}$
a) zero
b) null
c) One
d) None

## SECTION - B

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Give an example for concatenation of two strings. $\mathbf{C O 3}$
$\mathbf{1 2}$ What is meant by swapping? CO3
13 How to read and write string values? $\mathbf{C O 3}$
14 What is meant by recursion? CO4
15 Give an example to pass function as an argument. CO4
16 Give the format of the structure within the structure. $\mathbf{C O 5}$
17 What is meant by Pointer? CO5

## SECTION - C

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Write an example for character array with return arguments. CO3
19 Write a program for sum of any two matrices of any order. CO4
20 Write short notes on strcpy( ) function. CO4
21 Write a program for multiplication of any two matrices of same order. CO5
22 Write short notes about Pointer in Programming in C Language. CO5

## SECTION - D

Answer any ONE Question:
(1X 12= 12 Marks)
23 Write short notes about the scope, visibility and the life time of variables. CO4
24 Write short notes about structure with suitable examples. CO5

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|  | Course Code: | 05CT11 | Programme: | B.Sc. | CIA: | II |
|  | Date: | 19.11.2021 | Major: | Mathematics | Semester: | I |
|  | Duration: | 2 Hours | Year: | I | Max.Marks: | 50 |
|  | Course Title: | ALGEBRA AND TRIGONOMETRY |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( $10 \times 1$ X 10 Marks)
1 In a transformation of equation, if the roots multiplied by $\qquad$ then to multiply the successive terms beginning with the second by $\mathrm{m}, \mathrm{m}^{2}, \mathrm{~m}^{3}, \ldots \mathrm{~m}^{\mathrm{n}}$.
(A) $\mathrm{m}^{2}$
(B) -m
(C) m
(D) None

2 In a reciprocal equation, if $\alpha$ is a root then $\qquad$ is also a root.
(A) $1 / \alpha$
(B) $-\alpha$
(C) $\alpha^{2}$
(D) None

3 In an equation $x^{n}+1=0$ has only -1 as real roots if $n$ is $\qquad$ .
(A) even
(B) odd
(C) zero
(D) None

4 Between two consecutive real roots a \& b of the equation $f(x)=0$, there lies at least one real root of the equation $\qquad$ -
(A) $\mathrm{f}^{1}(\mathrm{x})=0$
(B) $\overline{f^{1}(x)}=1$
(C) $\mathrm{f}^{11}(\mathrm{x})=0$
(D) None
$5 \quad \sum \alpha^{2}=\left(\sum \alpha\right)^{2}$ - $\qquad$
(A) $2 \sum \alpha \beta$
(B) $\sum \alpha \beta^{2}$
(C) $\sum \alpha$
(D) None
$6 \quad \sum \alpha^{3} \beta=\left(\sum \alpha\right)^{2} \sum \alpha \beta$ - $\qquad$ CO4
(A) $\sum \alpha \beta^{2}$
(B) $\sum \alpha \beta \gamma$
(C) $\sum \alpha^{2} \beta \gamma$
(D) None

7 If $\alpha, \beta, \gamma \& \delta$ are the roots of the equation $x^{4}+\mathrm{px}^{3}+\mathrm{qx}^{2}+\mathrm{rx}+\mathrm{s}=0$ then $\sum \alpha=$ $\qquad$ CO4
(A) -p
(B) $q$
(C) -r
(D) None

8 In a reciprocal equation, if the fourth order equation has $\alpha \& \beta$ as roots then other roots are
CO5
(A) $1 / \alpha \& 1 / \beta$
(B) $-\alpha \&-\beta$
(C) $1-\alpha \& 1-\beta$
(D) None

9 M The effect of multiplication of a binomial factor $\mathrm{x}-\mathrm{a}$ is to introduce at least $\qquad$ change

CO5 of sign.
(A) 1
(B) 2
(C) 0
(D) None

10 The negative roots of $f(x)=0$ become the positive roots of $\qquad$ .

CO5
(A) $f(-x)=-f(x)$
(B) $\mathrm{f}(-\mathrm{x})=\mathrm{f}(\mathrm{x})$
(C) $f(-x)=0$
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Define equation. $\mathbf{C O 3}$
12 State Reminder theorem CO3
13 Write relations between the roots and the coefficients of $4^{\text {th }}$ degree equations. $\mathbf{C O 3}$
14 Find the quotient and reminder when $3 x^{3}+8 x^{2}+8 x+12$ is divided by $x-4$. CO4
15 If $\alpha, \beta, \gamma$ be the roots of the equation $x^{3}-6 x+7=0$, from an equation whose roots are

16 State Rolle's theorem.
CO5
17 Find the nature of the roots of the equation $4 x^{3}-21 x^{2}+18 x+20=0$.

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Solve the equation $81 x^{3}-18 x^{2}-36 x+8=0$ whose roots are in harmonic progression.
Find the roots of the equation $x^{5}+4 x^{4}+3 x^{3}+3 x^{2}+4 x+1=0$.
20 Find the equation whose roots are the squares of the roots of $x^{4}+x^{3}+2 x^{2}+x+1=0$.
21 Show that the equation $3 x^{4}-8 x^{3}-6 x^{2}+24 x-7=0$ has one positive, one negative and CO4 two imaginary roots.

Answer any ONE Question:
23 Solve the equation $6 x^{5}-6 x^{4}-43 x^{3}+43 x^{2}+x-6=0 . \quad$ CO4
24 The equation $x^{3}-3 x+1=0$ has a roots between 1 and 2 . Calculate it to three places of CO5 decimals.

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|  | Course Code: | 05CT12 | Programme: | B.Sc. | CIA: | II |
|  | Date: | 23.11.2021 | Major: | Mathematics | Semester: | I |
|  | Duration: | 2 Hours | Year: | I | Max.Marks: | 50 |
|  | Course Title: | DIFFERENTIAL CALCULUS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The $\qquad$ of the curvature of a curve at any point is called the radius of curvature at that point
(A) Square root
(B) Square
(C) reciprocal
(D) None

2 The value of $D^{n}\left(e^{a x}\right)$ is $\qquad$
(B) $a^{n} e^{a x}$
(C) $e^{a x-1}$
(D) None
(A) $n e^{a x}$
(C) $1 / y_{1}$
(D) None
4 The formula for length of the subnormal is $\qquad$
(A) $\frac{y_{1}}{y}$
(B) $\frac{y}{y_{1}}$
(C) $y y_{1}$
(D) None
(B) $-y_{1}$
(A) $y_{1}$

5 The abscissa of the centre of curvature of the curve $y=f(x)$ at $(x, y)$ is $\qquad$
(A) $x-\frac{y_{1}}{y_{2}}\left(1+y_{1}{ }^{2}\right)$
(B) $x+\frac{y_{1}}{y_{2}}\left(1+y_{1}{ }^{2}\right)$
(C) $x+\frac{y_{1}}{y_{2}}\left(1-y_{1}{ }^{2}\right)$
(D) $x-\frac{y_{2}}{y_{1}}\left(1+y_{1}{ }^{2}\right)$

CO3
3 The slope of the tangent is
CO3

6
In polar coordinates, $\frac{d s}{d r}$ is $\qquad$
(A) $\sqrt{r^{2}+\left(\frac{d r}{d \theta}\right)^{2}}$
(B) $\sqrt{\left(r \frac{d \theta}{d r}\right)^{2}+1}$
(C) $\sqrt{\left(r \frac{d \theta}{d r}\right)^{3}+1}$
(D) None

7 The locus of the centre of curvature is called $\qquad$
(A)Envelope
(B) evolute
(C) involute
(D) None

8 Any point on the hyperbola $\frac{x^{2}}{a^{2}}-\frac{y^{2}}{b^{2}}=1$ is......
(A) $(\mathrm{a} \cos \theta, \mathrm{b} \sin \theta)$
(B) $(\mathrm{a} \tan \theta, \mathrm{b} \sec \theta)$
(C) $(a \sec \theta, b \tan \theta)$
(D) None

9 For the curve $r=f(\theta)$, the angle $\varphi$ between the radius vector \& the tangent is given by tan $\varphi$ is $\qquad$
(A) $r \frac{d r}{d \theta}$
(B) $r \frac{d \theta}{d r}$
(C) $\frac{1}{r} \frac{d r}{d \theta}$
(D) None

10 The result $x \frac{\partial u}{\partial x}+y \frac{\partial u}{\partial y}=n u$ is $\qquad$ .
(A) Leibnitz's theorem
(B) Euler's theorem
(C) Laplace theorem
(D) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Show that, in the parabola $y^{2}=4 \mathrm{ax}$, the sub tangent at any point is double the abscissa. CO3
12 Prove that the subtangent to the curve $\mathrm{y}=\mathrm{a}^{\mathrm{x}}$ is of constant length. $\mathbf{C O 3}$
13 For the cycloid $x=a(1-\cos \theta), y=a(\theta+\sin \theta)$ find $\frac{d y}{d x}$. $\quad$ CO3
14 Write the formula of the coordinates of the center of curvature. CO4
15 Write the Cartesian formula for the radius of curvature. CO4
16 If $u=\frac{x y}{x+y}$ then Show that $x \frac{\partial u}{\partial x}+y \frac{\partial u}{\partial y}=u$. CO5
17 If $x^{3}+y^{3}=3 \mathrm{axy}$. Find $\frac{d y}{d x}$. $\quad$ CO5

## SECTION－C（Understanding）

Answer any THREE Questions：
18 Find the angle at which the radius vector cuts the curve $\frac{i}{r}=1+e \cos \theta$ ．
19 What is the radius of the curvature of the curve $x^{4}+y^{4}=2$ at the point $(1,1)$ ．
20 Find the radius of the curvature at any point of the cycloid $\begin{aligned} & x=a(\theta+\sin \theta) \text { and } y=a(1-\cos \theta) \text { ．}\end{aligned}$ $x=a(\theta+\sin \theta)$ and $y=a(1-\cos \theta)$ ．
21 State and Prove Euler＇s theorem．
22 Verify Euler＇s theorem when $u=x^{3}+y^{3}+z^{3}+3 x y z$ ．

## SECTION－D（Applying）

Answer any ONE Question：
23 Find the evolute of the ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ ．
24
If $u=\tan ^{-1} \frac{x^{x}+y^{x}}{x-y}$ ，then prove that $x \frac{\partial u}{\partial x}+y \frac{\partial u}{\partial y}=\sin 2 u$ ．
CO5

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|  | Course Code: | 05CT31 | Programme: | B.Sc | CIA: | II |
|  | Date: | 19.11.2021 | Major: | Mathematics | Semester: | III |
|  | Duration: | 2 Hours | Year: | II | Max. Marks: | 50 |
|  | Course Title: | DIFFERENTIAL EQUATIONS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 One of the solutions of the differential equation $\frac{d x}{x y}=\frac{d y}{y^{2}}=\frac{d z}{x(y z-2 x)}$ is $\qquad$ .
a) $\frac{x}{y}$
b) $\frac{y}{x}$
c) $\frac{y}{z}$
d) $-\frac{x}{y}$
$2 d(\log \sec x) / d x=$ $\qquad$ .
a) $\cos x$
b) $\tan x$
c) $\sin x$
d) $\sec x$

3 The general solution of the simultaneous differential equation $\frac{d x}{p}=\frac{d y}{Q}=\frac{d z}{R}$ is $\qquad$ , if $u=c$ and $v=c_{1}$ are the solutions of this equation.
a) $\phi\left(c, c_{1}\right)=0$
b) $\phi\left(-c, c_{1}\right)=0$
c) $\phi\left(\mathrm{c},-c_{1}\right)=0$
d) $\phi\left(-c,-c_{1}\right)=0$

4 One of the solutions of the differential equation $\frac{d x}{y}=\frac{d y}{z}=\frac{d z}{x}$ is $\qquad$ .
a) $x y-z=c$
b) $z x-\frac{y^{n}}{2}=c$
c) $x y-\frac{z^{x}}{2}=c$
d) $y z-\frac{x^{x}}{2}=c$

5 The value of $L\left\{e^{-4 t} f(t)\right\}=$ $\qquad$ -.
a) $F(s-4)$
b) $F(-s+4)$
c) $F(-s-4)$
d) $F(s+4)$

6 The value of $L\left\{\frac{f(t)}{t}\right\}=$ $\qquad$ .
a) $\int_{s}^{\infty} F(s) d t$
b) $\int_{s}^{\infty} F(s) d s$
c) $\int_{0}^{\infty} F(s) d t$
d) $\int_{0}^{\infty} F(s) d s$

7 The value of $L^{-1}\left(\frac{4}{(s-3)^{z}-16}\right)=$ $\qquad$ -.
a) $e^{-3 t} \sinh 4 t$
b) $e^{-3 t} \sin 4 t$
c) $e^{3 t} \sin 4 t$
d) $e^{3 t} \sinh 4 t$

8 In a partial differential equations, the general term of Standard 1 is $\qquad$ .
a) $f(p, q)=0$
b) $F(x, p, q)=0$
c) $f_{1}(x, p)=f_{2}(y, q)$
d) $z=p x+q y+f(p, q)$

9 In an equation $z=(x+a)^{2}+(y+b)^{2}, r=$ $\qquad$ .

CO5
a) 2
b) -2
c) -1
d) 0

10 The solution containing as many arbitrary constants as there are independent variables is called $\qquad$ . $\mathrm{CO5}$
a) Complete integral
b) Singular integral
c) Particular integral
d) General integral

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Solve the equations $\frac{\mathrm{dx}}{\mathrm{yz}}=\frac{\mathrm{dy}}{\mathrm{xz}}=\frac{\mathrm{d} z}{\mathrm{xy}}$.
12 Define simultaneous linear differential equations with constant coefficients. $\mathbf{C O 3}$
CO3

13 State the condition of integrability of equation $\mathrm{Pdx}+\mathrm{Qdy}+\mathrm{Rdz}=0$. $\mathbf{C O 3}$
14 Find the Laplace Transform of $\mathrm{te}^{-\mathrm{at}} \quad$ CO4
15 Determine $L^{-1}\left[\frac{s}{\left(\mathrm{~s}^{\mathrm{s}}+\mathrm{a}^{z}\right)^{\mathrm{z}}}\right]$. CO4
16 Solve $\frac{\delta^{2} z}{\delta y^{2}}=\sin y$. CO5
17 Eliminate a and b from $\mathrm{z}=(\mathrm{x}+\mathrm{a})(\mathrm{y}+\mathrm{b})$ and form PDE.
CO5

## SECTION - C (Understanding)

Answer any THREE Questions:
18 Solve the equations $\frac{d x}{y-x z}=\frac{d y}{y z+x}=\frac{d z}{x^{2}+y^{2}}$. $\quad \mathbf{C O 3}$
19 Derive $L\left[\mathrm{t}^{-\mathrm{t}} \sin \mathrm{t}\right.$ ].
CO4
20 Determine the inverse Laplace Transform of $\frac{1}{(s+1)\left(s^{2}+2 s+1\right)}$ CO4
21 Derive the partial differential equation of all spheres whose centres lie on the $\mathrm{z}-$ axis. CO5
22 Form PDE by using the elimination of arbitrary functions from the equation CO5 $\mathrm{z}=\mathrm{f}(\mathrm{x}+\mathrm{ay})+\varphi(\mathrm{x}-\mathrm{ay})$.

## SECTION - D (Applying)

Answer any ONE Question:
23 Solve the equation $\frac{d^{2} y}{d x^{2}}+2 \frac{d y}{d x}-3 y=\sin t$ given that $y=\frac{d y}{d t}=0$ when $t=0$. CO4

24 Find the general solution of the equation $x\left(y^{2}+z\right) p-y\left(x^{2}+z\right) q=z\left(x^{2}-y^{2}\right)$. CO5

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|  | Course Code: | 05CT32 | Programme: | B.Sc. | CIA: | II |
|  | Date: | 23.11.2021 | Major: | Mathematics | Semester: | III |
|  | Duration: | 2 Hours | Year: | II | Max.Marks: | 50 |
|  | Course Title: | NUMERICAL METHODS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( $10 \times 1=10$ Marks)
1 1. Gauss forward interpolation formula is used to interpolate the values of $y$ for
a) $0<p<1$
b) $-1<p<0$
c) $-1 / 2<p<1 / 2$
d) None

2 Gauss backward interpolation formula is used to interpolate the values of $y$ for values of $p$ lying between $\qquad$ _.
a) 0 and 1
b) -1 and 0
c) - 1 and 1
d) None

3 approximation between which asserts that any continuous function on a closed interval can be approximated by polynomial.
a) Weierstra's
b) Euler's
c) Weddle's
d) None

4 Newton's forward interpolation formula is used to interpolate the value of $y$ $\qquad$ . CO 3
a) Near the beginning
b) Near the end
c) Near the middle
d) None

5 First divided difference $\left[x_{1}, x_{2}\right]=$ $\qquad$ .
a) $\frac{y_{1}-y_{0}}{x_{1}-x_{0}}$
b) $\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$
c) $\frac{x_{2}-x_{1}}{y_{2}-y_{1}}$
d) None

6
If $f(x)=\frac{1}{x^{2}}$, the first divided difference $[a, b]=$ $\qquad$ .
a) $\frac{a^{2} b^{2}}{(a+b)}$
b) $-\frac{a^{2} b^{2}}{(a+b)}$
c) $\frac{(a+b)}{a^{2} b^{2}}$
d) None

7 Angular velocity $=$ $\qquad$ CO 4
a) $\frac{d^{2} \theta}{d t^{2}}$
b) $\frac{d \theta}{d t}$
c) $\frac{d s}{d t}$
d) None

8 Euler's method is the Runge - kutta method of $\qquad$ order
a) First
b) Second
c) Third
d) None

9 Which of the following is pointwise method?
$\mathrm{CO5}$
a) Runge - kutta
b) Picards
c) Milne's
d) None

10
$y_{n}=y_{0}+\int_{x_{0}}^{x} f\left(x, y_{n-1}\right) d x$, where $n=1,2,----$
a) Picards formula
b) Eulers formula
c) Taylor's formula
d) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Which equation is known as the Weddle's rule? $\mathbf{C O 3}$
12 Write Newton-Cote's Quadrature formula. $\mathbf{C O 3}$
13 Define Numerical Differentiation. $\quad$ CO3
14 Write the formula for $\left(\frac{d y}{d x}\right)_{x=x_{n}}$ using Newton's backward difference formula. CO4
15 Write the formula for $\left(\frac{d^{2} y}{d x^{2}}\right)$ using Newton's forward difference formula. CO4
16 Write the formula for First order R-K method. CO5
17 What do you mean by predictor-Corrector method? CO5

Answer any THREE Questions:
18 Show that $\mathrm{y}^{1}(x)=2 x^{3}-\frac{21}{2} x^{2}+28 x-11$ for the given data.

| $x$ | 0 | 1 | 2 | 3 | 4 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{Y}=(x)$ | 1 | 1 | 15 | 40 | 85 |

19 Evaluate: $\int_{0}^{1} \frac{d y}{1+x^{2}}$ using Trapezoidal rule with $\mathrm{h}=0.2$. Hence determine the value of $\pi \quad$ CO4
20 Evaluate: $\int_{0}^{1} \frac{d y}{1+x}$ using Weddle's rule.
21 Using Taylor's method solve $\left(\frac{d y}{d x}\right)=1+x y$ with $\mathrm{y}_{0}=2$. Find (i) y (0.1) (ii) y (0.2).
CO5
22 Solve $\left(\frac{d y}{d x}\right)=1-\mathrm{y}, \mathrm{y}(0)=0$ using Euler's method and find y at $x=0.1$ and 0.2 . Compare the CO5 results of the exact solution.

## SECTION - D (Applying)

Answer any ONE Question:
23 Evaluate $\int_{0}^{\pi / 2} \sin x \mathrm{~d} x$ by Simpson's $1 / 3$ rule dividing the range into six equal parts.
24 Compute $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of $4^{\text {th }}$ order for the differential CO5 equation. $\frac{d y}{d x}=x y+y^{2}, y(0)=1$.

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|  | Course Code: | 05CT51 | Programme: | B.Sc | CIA: | II |
|  | Date: | 19.11.2021 | Major: | Mathematics | Semester: | V |
|  | Duration: | 2 Hours | Year: | III | Max.Marks: | 50 |
|  | Course Title: | STATISTICS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( 10 X 1 = 10 Marks)
1 The characteristic function $\phi_{x}(t)=$ $\qquad$ .

CO
(A) $E\left(e^{t x}\right)$
(B) $\mathrm{E}\left(\mathrm{e}^{\text {it }}\right)$
(C) $\mathrm{E}\left(\mathrm{e}^{\mathrm{itx}}\right)$
(D) None

2 At $\mathrm{t}=0$, the value of $\frac{d^{r}}{d t^{r}}\left(M_{X}(t)\right)=$ $\qquad$ .
(A) $\mu_{r}$
(B) $\mu_{r}^{1}$
(C) $\mu^{1}$
(D) None

3 If $X$ is a $B(n, p)$, then the mean value is
(A) npq
(B) nq
(C) $n p$
(D) None

4 The probability function $P(X=x)=\frac{e^{-x} \lambda^{x}}{x!}$ is $\qquad$ distribution.
(A) Binomial
(B) Poisson
(C) Normal
(D)None

5 If X is normal variate with parameter
CO 4
(A) $\mu \& \sigma$
(B) $\sigma^{2}$
(C) $\mu \& \sigma^{2}$
(D) None

6 If X is $N\left(\mu, \sigma^{2}\right)$ then the value of $\gamma_{1}$ is
CO
(A) 1
(B) zero
(C) 2
(D)None

7 The student's $t$ distribution $t=\frac{\bar{x}-\mu}{s / \sqrt{n-1}} \quad$ has ___ degrees of freedom.
(A) $n-1$
(B) $\mathrm{n}+1$
(C) $n$
(D) None

8 In F distribution, if $\sigma_{x}^{2}=\sigma_{y}^{2}=\sigma^{2}$ then $\qquad$ .
$\mathrm{CO5}$
(A) $F=\frac{n_{2} s_{2}^{2} / n_{2}-1}{n_{1} s_{1}^{2} / n_{1}-1}$
(B) $F=\frac{n_{1} s_{1}^{2} / n_{1}+1}{n_{2} s_{2}^{2} / n_{2}+1}$
(C) $F=\frac{n_{1} s_{1}^{2} / n_{1}-1}{n_{2} s_{2}^{2} / n_{2}-1}$
(D) None

9 The application based on $\qquad$ distribution is population variance.
$\mathrm{CO5}$
(A) T
(B) $\chi^{2}$
(C) F
(D)None

10 If the sample size n is large, the condition is $\qquad$ .
$\mathrm{CO5}$
(A) $n=30$
(B) $\mathrm{n}<30$
(C) $n>30$
(D)None

## SECTION - B (Remembering)

Answer any FIVE Questions:
11 Describe the mean of the Poisson distribution is $\lambda$. CO
12 If X has a Poisson distribution and $P(X=0)=P(X=1)=k$. Show that $k=1 / e$. CO3
13 Define normal distribution and draw normal distribution curve. CO3
14 Write the Fiducial limits. CO4
15 Define test of significance based on F-test. $\mathbf{C O 4}$
16 A random sample of size 25 from a population gives the sample S.D. 8.5. Test the CO5 hypothesis that the population S.D. is 10 .
17 Define $\chi^{2}$ - test to the goodness of fit.

## SECTION - C (Understanding)

Answer any THREE Questions:
18 The marks of 1000 students in a university are found to be normally distributed with mean CO3 70 and SD 5. Estimate the number of students whose marks will be (i) between 60 \& 75 (ii) more than 75 (iii) less than 68 .

19 A random sample of 10 boys has the following I.Q. (Intelligent Quotients) 70, 120, 110, $101,88,83,95,98,107$, and 100 . Do these data support the assumption of a population mean I.Q. of 100 ? (T-test of $9=2.26$ ).
20 Test the equality of S.D.s for the data given below at $5 \%$ level of significance $n_{1}=10 ; n_{2}=14 ; s_{1}=1.5 ; s_{2}=1.2$. (F-test of $(9,13)=2.72$ )
21 Prove that $\chi^{2}=\sum_{i=1}^{k} \frac{\left(o_{i}-e_{i}\right)^{2}}{e_{i}}=\sum_{i=1}^{k} \frac{o_{i}{ }^{2}}{e_{i}}-n$ where there are $k$ set of theoretical and observed values with the total freq $n$.
22 The S.D of the distribution of times taken by 15 workers for performing a job is 6.4 sec . CO5 Can it be taken as a sample from a population whose s.d is 5 sec ?. (value of $14=23.685$ )

## SECTION - D (Applying)

Answer any ONE Question:
23 In one sample of 8 observations the sum of the squares of deviation of the sample values from the sample mean was 84.4 and in another sample of 10 observation it was 102.6. Test whether the difference in variances is significant at $5 \%$ level using F-Test. (F-test $(7,9)=3.29)$.
24 The theory predicts that the proportion of an object available in the four groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 items of this object the numbers in the four groups were $882,313,287$ and 118. Use $\chi^{2}$ test to verify whether the experimental result supports the theory. (the value of $3=7.851$ )

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|  | Course Code: | 05CT52 | Programme: | B.Sc | CIA: | II |
|  | Date: | 20.11.2021 | Course: | Mathematics | Semester: | V |
|  | Duration: | 2 Hours | Year: | III | Max. Marks: | 50 |
|  | Course Title: | MODERN ALGEBRA |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 In the quotient group $\frac{G}{N}, \mathrm{~N}$ is $\qquad$ .
(a) any proper subgroup of G
(b) a cyclic subgroup of G
(c) a normal subgroup of G
(d) a proper abelian subgroup of G

2 Let G be a finite group. Let H and K be subgroup of G such that H is a subgroup of K .
Then $\qquad$ .
(a) $[\mathrm{G}: \mathrm{H}][\mathrm{H}: \mathrm{K}]=[\mathrm{G}: \mathrm{K}]$
(b) $[\mathrm{G}: \mathrm{K}][\mathrm{K}: \mathrm{H}]=[\mathrm{G}: \mathrm{H}]$
(c) $[\mathrm{G}: \mathrm{K}][\mathrm{H}: \mathrm{K}]=[\mathrm{G}: \mathrm{H}]$
(d)none of the above

3 "If G is a finite group and H is any subgroup of G then the order of H divides the order of G". This theorem is known as $\qquad$ .
(a) Cayley's theorem
(b) Lagrange's theorem
(c) Euler's theorem
(d) Fermat's theorem

4 Index of the subgroup 5 Z in (Z,+ ) is $\qquad$ .
(a) 3
(b) 5
(c) 7
(d)infinite

5 The number of automorphisms of a cyclic group of order n is $\qquad$ .
(a) $\varphi(n)$
(b) n
(c) $n^{2}$
(d) 1

6 The group $(\mathrm{Z},+)$ and $(\mathrm{Q},+)$ are not isomorphism because $\qquad$ .

CO 4
(a) $(\mathrm{Z},+)$ is cyclic but $(\mathrm{Q},+)$ is not cyclic
(b) $(\mathrm{Z},+)$ is abelian but $(\mathrm{Q},+)$ is not abelian
(c) $(\mathrm{Z},+)$ is a finite group $(\mathrm{Q},+)$ is an infinite group
(d) every element other 0 is of infinite order in $(\mathrm{Z},+)$ but every elements is of finite order in ( $\mathrm{Q},+$ )
7 The kernel of homomorphism $\mathrm{f}:(\mathrm{Z},+) \rightarrow(Z,+)$ given $\mathrm{f}(\mathrm{x})=2 x$ is $\qquad$ .

CO 4
(a) Z
(b) $\left\{\frac{1}{2}\right\}$
(c) $\{1\}$
(d) $\{0\}$

8 The map f: $Z \rightarrow Z$ defined by $f(x)=x^{2}+3$ is $\qquad$ .
(a) a ring homomorphism
(b) not a ring homomorphism
(c) a ring isomorphism
(d) a ring epimorphism

9 Let R be a commutative ring. Then for all $\mathrm{a}, \mathrm{b} \in R$ is $\qquad$ .
(a) $(a+b)^{2}=a^{2}+2 a b+b^{2}$
(b) $(a+b)^{2}=a^{2}+b^{2}$
(c) $(a-b)^{2}=a^{2}-b^{2}$
(d) $(a+b)^{2} \neq 0$

10 An example of an infinite commutative ring without identity is $\qquad$ .
(a) $(\mathrm{Z},+$, .)
(b) $\left(\mathrm{Z}_{\mathrm{n}}, \oplus, \otimes\right)$
(c) $(2 Z,+$, .)
(d) $\mathrm{M}_{2}(\mathrm{R})$

## SECTION - B (Remembering)

11 If H is a subgroup of G and N is a normal subgroup of G then show that HN is a subgroup ..... CO3 of G.

12 Define quotient group with example.
13 Prove that the intersection of two normal subgroup of $G$ is a normal subgroup of $G$ CO3
14 Verify that $\left(\mathrm{Z}_{4}, \oplus\right)$ is isomorphic to $\mathrm{V}_{4}$ or not.
15 Let $f: \mathrm{G} \rightarrow \mathrm{G}$ ' be a homomorphism. Then express $f$ is $1-1$ iff $\operatorname{ker} f=\{\mathrm{e}\}$. CO4
16 Let $R$ be a ring with identity. Then express that $S=\{n .1 / n \in Z\}$ is a subring of $R$. CO5
17 Define characteristic of the Ring with example.

18 State and prove Fermat's Theorem. CO3
19 Prove that isomorphism preserves the order of each element in a group. CO4
20 Show that $\mathrm{Z}_{\mathrm{n}}$ is an integral domain iff n is prime. $\mathbf{C O 4}$
21 State and prove Cayley's Theorem. CO5
22 Let R be a commutative ring with identity. Let P be an ideal of R . Then prove that P is a $\mathbf{C O 5}$ prime ideal $\Leftrightarrow R / P$ is an integral domain.

## SECTION - D (Applying)

Answer any ONE Question:
23 State and prove that fundamental theorem of homomorphism.
24 Let $R$ be a commutative ring with identity. Show that an ideal $M$ of $R$ is maximal iff $R / M$ CO5 is an ideal.

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|  | Course Code: | 05CT53 | Programme: | B.Sc. | CIA: | II |
|  | Date: | 22.11.2021 | Major: | Mathematics | Semester: | V |
| Mancirum | Duration: | 2 Hours | Year: | III | Max.Marks: | 50 |
|  | Course Title: | REAL ANALYSIS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( 10 X 1 = 10 Marks)
1 The incorrect statement is $\qquad$ CO3
(A) $\mathbf{Q}$ is of second category
(B) $\mathbf{R}$ is of second category
(C) $l_{2}$ is of second category
(D)Any complete metric is of second category

2 The correct statement is $\qquad$
(A) A subspace of a complete metric space is always complete
(B) A subset of a complete metric space M is complete iff A is open
(C) $\mathbf{Q}$ is complete in $\mathbf{R}$
(D)C with usual metric is complete

3 Which of the following is a dense set in R with usual metric?
(A) $\mathbf{Z}$
(B) $\mathbf{Q}$
(C) $[0, \infty)$
(D) $(-\infty, 0]$

4 In $[0,1]$ with discrete metric, the closure of $\mathrm{A}=\mathbf{Q} \cap(0,1)$ CO
(A) $(0,1)$
(B) A
(C) $[0,1]$
(D) $(0,1]$

5 Which of the following is a compact metric space with usual metric? CO4
(A) $\mathbf{R}$
(B) $(0,1)$
(C) $[0, \infty)$
(D) $[0,1]$

6 If $\mathrm{f}: \mathbf{R} \rightarrow \mathbf{R}$ is continuous then $\qquad$ CO4
(A) f is $1-1$
(B) f is onto
(C) f is uniformly continuous
(D) None

7 Let $\mathrm{f}: \mathbf{R} \rightarrow \mathbf{R}$ be a continuous function and let $\mathrm{A}=\{\mathrm{x} \in \mathbf{R} / \mathrm{f}(\mathrm{x})=0\}$. Then $\qquad$ .

CO4
(A) A is closed
(B) A is open
(C) A is bounded
(D) A is compact

8 The incorrect statement is $\qquad$ -.
(A) Any compact subset A of a metric space ( $\mathrm{M}, \mathrm{d}$ ) is closed
(B) Any compact subset A of a metric space ( $\mathrm{M}, \mathrm{d}$ ) is bounded
(C) If A and B are compact subsets of a metric space $M$ then AUB is compact
(D) $\mathbf{R}$ with usual metric is compact

9 Which of the following subset of $\mathbf{R}$ is neither compact nor connected? $\mathrm{CO5}$
(A) $\mathbf{R}$
(B) $(0,1)$
(C) $[0,100]$
(D) $\mathbf{Q}$

10 Which of the following is a compact subset of $\mathbf{R}^{2}$ ?
$\begin{array}{ll}\text { (A) }\{(\mathrm{x}, \mathrm{y}) / \mathrm{x} 2+\mathrm{y} 2=1\} \text { (B) }\{(\mathrm{x}, \mathrm{y}) / \mathrm{x}=0\} & \text { (C) }\{(\mathrm{x}, \mathrm{y}) / \mathrm{x}=0 \text { or } \mathrm{y}=0\}\end{array}$ (D) $\{(\mathrm{x}, \mathrm{y}) / \mathrm{x}, \mathrm{y} \in \mathbf{Q}\}$ SECTION - B (Remembering)
Answer any FIVE Questions:
( 5 X $2=10$ Marks )
11 Define complete metric space. CO3
12 Define open map. CO3
13 Define homeomorphism of a function CO3
14 Define connected metric space. CO4
15 Give an example to show that a subspace of a connected metric space need not be connected. CO4
16 Define compact metric space. CO5
17 Define sequentially compact metric space. CO5

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 Show that $\mathbf{C}$ with usual metric is complete. $\mathbf{C O 3}$
19 State and Prove Intermediate value theorem. CO4
20 Let $M$ be a metric space. Let $A$ be a connected subset of $M$. If $B$ is subset of $M$ such that CO4 $A \subseteq B \subseteq \bar{A}$ then prove that B is connected.
21 Prove that continuous image of a compact metric space is compact. CO5
22 Prove that a closed subspace of a compact metric space is a compact. CO5

## SECTION - D (Applying)

Answer anyone Question:
(1X 12= 12 Marks)
23 Prove that a subspace of $R$ is connected iff it is an interval.
CO4
24 State and Prove Heine Borel theorem. CO5

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|  | Course Code: | 05CT54 | Programme: | B.Sc | CIA: | II |
|  | Date: | 24.11.2021 | Major: | Mathematics | Semester: | V |
|  | Duration: | 2 Hours | Year: | III | Max.Marks: | 50 |
|  | Course Title: | STATICS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 If the resultant of $\overline{O A}, \overline{O B}$ is $2 \overline{O C}$ then C is $\qquad$ .
(a) Centroid of $\triangle \mathrm{OAB}$
(b) orthocenter of $\triangle \mathrm{OAB}$
(c) midpoint of AB
(d) None

2 The moment of a force $\bar{F}$ about a point O is $\qquad$ ( r is perpendicular distance from O to $\bar{F} \mathbf{C O 3}$
(a) $\bar{r} \cdot \bar{F}$
(b) $\bar{r} \times \bar{F}$
(c) $\bar{F} \times \bar{r}$
(d) None

3 If the resultant R is least, then the angle between the two forces P and Q will be
CO
(a) 0
(b) $\pi / 4$
(c) $\pi$
(d) None

4 When a rod is resting with one end in contact with a smooth plane, the angle between the
CO reaction R and the plane at the point of contact will be $\qquad$ .
(a) 0
(b) $45^{0}$
(c) $90^{\circ}$
(d) None

5 When the motion ensures by one body sliding over another, the friction exerted is callf CO4 friction.
(a) Dynamical
(b) statical
(c) limiting
(d) None

6 With usual notations, F/R = $\qquad$ .
(c) $\tan \lambda$ of angle of friction.
(d) None
(a) $\operatorname{Tan} \alpha$
(b) $\tan \mu$

7 The coefficient of friction is equal to the $\qquad$ (c) sine
(d) None

8 Intrinsic equation of the catenary $\qquad$ -.
(a) $c=s \tan \psi$
(b) $\mathrm{s}=\mathrm{c} \tan \psi$
$\qquad$ (c) $\tan \psi=\mathrm{sc}$
(d) None

9 Tension at any point in the catenary is .
(a) Wy
(b) $\mathrm{W}_{\mathrm{x}}$
(c) $\cos ^{-1}(\mathrm{y} / \mathrm{c})$
(d) None

10 With usual notation, the relation connecting $y$ and $\psi$ is $\qquad$ .

CO4
(a) Tangent
(b) $y=\sec \psi$
(c) $y=c \sec \psi$
(d) None

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 If forces $\mathrm{P}_{1}, \mathrm{P} 2, \mathrm{P} 3$ act along the sides $\mathrm{BC}, \mathrm{CA}, \mathrm{AB}$ of an $\triangle \mathrm{ABC}$, and if they reduce to a $\mathbf{C O 3}$ couple, show that $\frac{P_{1}}{B C}=\frac{P_{z}}{C A}=\frac{P_{3}}{A B}$.
12 Forces $3,2,4,5 \mathrm{~kg}$ wt. act respectively along the sides $\mathrm{AB}, \mathrm{BC}, \mathrm{CD}$ and DA of a square. CO
Resolve the forces along AB and AD .
13 If the algebraic sum of the moments of a system of coplanar forces about each of three non-collinear points in their plane be same in magnitude and sign. Prove that the system reduce to a couple.
14 Define: Statical Function.
15 Define: Coefficient of friction.
16 Given any one geometrical property of common catenary.
CO5
17 Find the relation between x and $\Psi$ in equilibrium of strings.

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6=18 Marks)
18 If a system of forces acts on a rigid body and if the algebraic sum of their moments about $\mathbf{C O 3}$ each of three non-collinear points is zero separately, the system of forces will be in equilibrium.
19 A particle of weight 30 kgs , resting on a rough horizontal plane is just on the plane of motion when acted on by horizontal forces of 6 kg wt. and 8 kg . wt. at right angles to each other. Find the coefficient of friction between the particle and the plane and the direction in which the friction acts.

20 A partical is placed on the outside of a rough sphere whose coefficient of friction is $\mu$ ．CO4 Show that it will be on the point of motion when the radius from it to the centre makes an angle $\tan ^{-1} \mu$ with the vertical．
21 Derive Cartesian equation of the catenary．
22 A uniform chain of length $l$ is to be suspended form two points in the same horizontal line so that either terminal tension is n times that at the lowest point．Show that the span must be $\frac{l}{\sqrt{n^{2}-1}} \log \left(n+\sqrt{n^{2}-1}\right)$ ．

## SECTION－D（Applying）

Answer any ONE Question：
23 Explain equilibrium of a body on a rouge inclined plane under any force．
24 Show that the length of an endless chain which will hang over a circular pulley of radius CO5 ＂a＂so as to be in contact with two－thirds of the circumference of the pulley is
$a\left[\frac{3}{\log (2+\sqrt{3})}+\frac{4 \pi}{3}\right]$ ．

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| Date: | 23.11 .2021 | Major: | Mathematics | Semester: | V |  |  |  |
| Duration: | 2 Hours | Year: | III |  | Max. Marks: |  |  |  |
| Course Title: | LINEAR PROGRAMMING |  |  |  |  |  |  |  |

## SECTION - A

Answer ALL the Questions:
(10 X 1 = 10 Marks)
1 The dual of the primal maximization LPP is
a) a minimization LPP
b) a maximization LPP
c) both $a$ and $b$
d) none of them

2 If dual has an unbounded solution, primal has
a) an unbounded solution
b) an infeasible solution
c) a feasible solution
d) none of the above

3 The number of primal constraints is equal to the number of $\qquad$ CO 3
a) dual variables
b) dual constraints
c) both $a$ and $b$
d) none of them

4 The dual constraint corresponding to an artificial variable in the standard form of the primal is always
a) redundant
b) symmetric
c) un-symmetric
d) none of these

5 The transportation problem deals with the transportation of $\qquad$ CO 4
a) a single product from several sources to a destination
b) a multi-product from several sources to several destinations
c) a single product from several sources to several destinations
d) a single product from a source to several destinations

6 The solution to a T.P with $m$-sources and $n$-destinations is feasible, if the number of
CO 4 allocations are $\qquad$
a) $m+n$
b) $m+n+1$
c) $m+n-1$
d) $m-n$

7 In a transportation problem, $z_{i j}=$
CO 4
a) $u_{i}+v_{j}$
b) $u_{i}-v_{j}$
c) $u_{j}+v_{i}$
d) $u_{j}-v_{i}$

8 In an assignment problem, the number of rows is $\qquad$ to number of columns
$\mathrm{CO5}$
a) less than
b) greater than
c) equal
d) less than or equal

9 Hungarian Assignment method is also called
$\mathrm{CO5}$
a) reduced matrix method
b) MODI method
c) all the above
d) none of them

10 For a salesman, who has to visit $n$ cities, following are the ways of his tour plan
a) $n$
b) $n!$
c) $(n+1)$ !
d) $(n-1)$ !

## SECTION - B

Answer any FIVE Questions:
(5 X 2 = 10 Marks )
11 Define Dual problem in Linear Programming problem?
CO3
12 Define Primal problem in Matrix form? CO3
13 Write down the steps for obtaining IBFS using LCM? CO3
14 What is meant by triangular basis of the system? CO4
15 Define Degeneracy in transportation problem? CO4
16 Write down the mathematical formulation of Assignment Problem? CO5
17 How to get optimum solution in assignment problem?
CO5

## SECTION - C

Answer any THREE Questions:
(3X6=18 Marks)
18 Write down the steps involved in the formation Primal-Dual pair.
CO3
19 Obtain the dual of the LPP: Maximize $z=2 x_{1}+3 x_{2}+x_{3}$; Subject to the CO4 constraints: $4 x_{1}+3 x_{2}+x_{3}=6, \quad x_{1}+2 x_{2}+5 x_{3}=4, \quad x_{i} \geq 0, \quad(i=1,2,3)$.
20 Find an initial basic feasible solution to the following T.P. using NWCM.

| Factories | Ware Houses |  |  |  |  | Availability |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{W}_{1}$ | $\mathrm{~W}_{2}$ | $\mathrm{~W}_{3}$ | $\mathrm{~W}_{4}$ | $\mathrm{~W}_{5}$ |  |
| F1 | 20 | 28 | 32 | 55 | 70 | 50 |
| F2 | 48 | 36 | 40 | 44 | 25 | 100 |
| F3 | 35 | 55 | 22 | 45 | 48 | 150 |
| Requirement | 100 | 70 | 50 | 40 | 40 |  |

21 Consider the following transportation table showing production and transportation costs， along with the supply and demand positions of factories／distribution centres：

|  | $\mathbf{M}_{1}$ | $\mathbf{M}_{2}$ | $\mathbf{M}_{3}$ | $\mathbf{M}_{4}$ | Supply |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{F}_{1}$ | 4 | 6 | 8 | 13 | 500 |
| $\mathrm{~F}_{2}$ | 13 | 11 | 10 | 8 | 700 |
| $\mathrm{~F}_{3}$ | 14 | 4 | 10 | 13 | 300 |
| $\mathrm{~F}_{4}$ | 9 | 11 | 13 | 3 | 500 |
| Demand | 250 | 350 | 1050 | 200 |  |

Obtain an initial basic feasible solution by using VAM．
22 A department head has four subordinates，and four tasks to be performed．The subordinates differ in efficiency，and the tasks differ in their intrinsic difficulty．His estimate，of the time each man would take to perform each ask，is given in the matrix below：

| Tasks | Men |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | E | F | G | H |
| A | 18 | 26 | 17 | 11 |
| B | 13 | 28 | 14 | 26 |
| C | 38 | 19 | 18 | 15 |
| D | 19 | 26 | 24 | 10 |

How should the tasks be allocated，one to a man，so as to minimize the total man－hours？

## SECTION－D

Answer any ONE Question：
23 Find the starting solution in the following transportation problem by VAM．Also obtain the optimum solution：

|  | $\mathrm{D}_{1}$ | $\mathrm{D}_{2}$ | $\mathrm{D}_{3}$ | $\mathrm{D}_{4}$ | Supply |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{S}_{1}$ | 3 | 7 | 6 | 4 | 5 |
| $\mathrm{~S}_{2}$ | 2 | 4 | 3 | 2 | 2 |
| $\mathrm{~S}_{3}$ | 4 | 3 | 8 | 5 | 3 |
| Demand | 3 | 3 | 2 | 2 |  |

24 A pharmaceutical company is producing a single product and is selling it through five agencies located in different cities．All of a sudden，there is a demand for the product in another five cities not having any agency of the company．The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the product to needy cities in such a way that the travelling distance is minimized．The distance between the surplus and deficit cities（in km ）is given in the following table：

|  |  | Deficit cities |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Surplus <br> cities |  | a | b | c | d | e |
|  | A | 85 | 75 | 65 | 125 | 75 |
|  | B | 90 | 78 | 66 | 132 | 78 |
|  | C | 75 | 66 | 57 | 114 | 69 |
|  | D | 80 | 72 | 60 | 120 | 72 |
|  | E | 76 | 64 | 56 | 112 | 68 |

Determine the optimum assignment schedule．

|  | VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST - 625234 DEPARTMENT OF MATHEMATICS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Course Code: | 05NE11 |  |  | CIA: | II |
|  | Date: | 22.11.2021 |  |  | Semester: | I |
|  | Duration: | 2 Hours | Year: | I | Max.Marks: | 50 |
|  | Course Title: | FUNDAMENTALS OF MATHEMATICS |  |  |  |  |

## SECTION - A (Remembering)

Answer ALL the Questions:
( 10 X 1 = 10 Marks)
1 The value of $2^{-3}$
CO1
3/2
b) 1.0
c) 0.12
d) none

2 In the ratio 3:2=a:8 the value of $a$ is $\qquad$ CO 2
a) 10
b) 8
c) 14
d) 12

3 Find the identity Matrix
CO 3
a) $\left(\begin{array}{ll}1 & 0 \\ 0 & 1\end{array}\right)$
b) $\left(\begin{array}{ll}0 & 1 \\ 2 & 3\end{array}\right)$
c) $\left(\begin{array}{ll}1 & 2 \\ 0 & 0\end{array}\right)$
d) None

4 Find the Scalar matrix
$\mathrm{CO3}$
a) $\left(\begin{array}{ll}5 & 0 \\ 0 & 5\end{array}\right)$
b) $\left(\begin{array}{ll}0 & 0 \\ 0 & 0\end{array}\right)$
c) $\left(\begin{array}{ll}0 & 1 \\ 0 & 5\end{array}\right)$
d) $\left(\begin{array}{ll}1 & 0 \\ 0 & 5\end{array}\right)$

5 The slope of the straight line $a x+b y+c=0$ is
a) $)^{c} / a$
b) $c / b$
c) $b / a$
d) $-a / b$

6 Find the duplicate of the ratio $\mathrm{a}: \mathrm{b}$ is $\qquad$ CO 4
a) $8: 27$
b) $4: 9$
c) $5: 1$
d) $25: 10$

7 The Fifth term in the GP $3,6,12 \ldots \ldots \ldots$ is
CO4
a) 28
b) 25
c) 82
d) 48

8 The distance between $(0,0)$ and $(6,8)$ points by $\qquad$ $\mathrm{CO5}$
a) 5
b) 10
c) 20
d) 30

9 The ratio between any terms to the previous terms of GP is $\qquad$ $\mathrm{CO5}$
a)common difference
b) Ratio
c) common ratio
d) Term

10 The decimal value of the 4:20 is
CO5
a)0.1
b) 0.2
c) 0.3
d) 0.4

## SECTION - B (Remembering)

Answer any FIVE Questions:
(5 X 2 = 10 Marks)
11 Show that $\sqrt{45}+\sqrt{180}-\sqrt{125}=4 \sqrt{5}$
CO1
12 Find the compound ratio for $3: 2$ and $4: 5$ CO2
13 Calculate the distance between the points $(3,7)$ and $(4,8) \quad \mathbf{C O 3}$
14 Find the slope of the line joining the two points ( $-3,2$ ) and (6,7) $\mathbf{C O 3}$
15 If $\mathrm{A}=\left(\begin{array}{ll}1 & 0 \\ 2 & 3\end{array}\right)$ and $\mathrm{B}=\left(\begin{array}{ll}1 & 3 \\ 4 & 1\end{array}\right)$ then find $\mathrm{A}+\mathrm{B} \quad \mathrm{CO4}$
16 Define Arithmetic progression CO5
17 Find the mean proportional to 20 and 180 CO5

## SECTION - C (Understanding)

Answer any THREE Questions:
(3 X 6= 18 Marks)
18 If $x=2^{2 / 3}+2^{1 / 3}$, then prove that $x^{3}-6 x=6 \quad$ CO1
19 Find the mean proportion of 9 and 40 and the third proportion between 4 and 6 CO2
20 Find the roots of $2 x^{2}+9 x+10=0 \quad \mathbf{C O 3}$
21 If $\mathrm{A}=\left(\begin{array}{ll}2 & 4 \\ 1 & 2\end{array}\right), \mathrm{B}=\left(\begin{array}{cc}1 & 1 \\ -3 & 2\end{array}\right)$ and $\mathrm{C}=\left(\begin{array}{ll}1 & 0 \\ 0 & 1\end{array}\right)$ then
CO4
Find i) $2 \mathrm{~A}+3 \mathrm{~B}-2 \mathrm{C}$
22 Show that the points $(8,-10)(7,-3)$ and $(0,-4)$ are vertices of right angled Triangle
$\mathrm{CO5}$

## SECTION - D (Applying)

Answer any ONE Question:
(1X 12= 12 Marks)
23 Monthly income of A and B are in the ratio of 5:6 and their expenses in the ratio 4:5. If
each save Rs. 200 per month. Find their incomes.
24
If $A=\left(\begin{array}{lll}1 & 2 & 3 \\ 0 & 2 & 1 \\ 3 & 2 & 0\end{array}\right)$ then find $A^{-1}$

