05AT01

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. (Phy. / Chem.) Degree (Semester) Examinations, November 2019

Part – III : Allied Subject : Third Semester : Paper – II

MATHEMATICS – I

Under CBCS – Credit 4

Time: **3** Hours | Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The derivative of cosx is ______________

   a) - sinx b) sinx c) tanx d) None

2. The value of $\sin^2 x + \cos^2 x$ is ____________

   a) 0 b) 1 c) -1 d) None

3. The derivative of cosechx is _____________

   a) cosechxcothx b) cothx c) –cosechxcothx d) None

4. The derivative of $\sinh^{-1}x$ is _______________

   a) $\frac{1}{x\sqrt{x^2-1}}$ b) $\frac{1}{\sqrt{1+x^2}}$ c) $\frac{-1}{x\sqrt{x^2-1}}$ d) None

5. The n^{th} derivative of y is ______________.

   a) y_{n-1} b) y_{n+1} c) y_n d) None

6. The value of $\int \frac{1}{\sqrt{1-x^2}}\,dx$ is

   a) $\cos^{-1}x$ b) $\sin^{-1}x$ c) $\tan^{-1}x$ d) None

7. If f(x) is odd function, then f(-x) is

a) f(x) b) – f(x) c) zero d) None

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

a) 1 b) non zero c) zero d) None

9. The value of sinh(iπ/2) is _______ .

a) 1 b) 0 c) i d) None

10. Inverse hyperbolic function $\cosh^{-1}x$ = ________.

a) $\log\left(x-\sqrt{x^2+1}\right)$ b) $\log\left(x+\sqrt{x^2+1}\right)$

c) $\log\left(x+\sqrt{x^2-1}\right)$ d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Find the solution of $\cosh^2 x - \sinh^2 x$ and prove it.

12. Find the solution of $\frac{d}{dx}\left(\sin x^2\right)$.

13. Differentiate $\tan^{-1} x$.

14. Solve $\int_0^1\int_0^2 xy^2\ dy\ dx$.

15. Write the unit normal vector to the surface $\varphi(x,y,z)=c$.

16. Write the surface integral of f over s on the $x-y$ plane.

17. Prove that $\sinh 2x = 2\sinh x\cosh x$.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Prove that $2^5\cos^6\theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10$.

(OR)

b) *If* $\cos(x+iy) = \cos\theta + i\sin\theta$ Prove that $\cos 2x + \cosh 2y = 2$.

19. a) Find y' *if* $y = x^{\sin x}$.

(OR)

b) Find y' *if* $x^3+y^3 = 3axy$.

20. a) Evaluate $\int_0^{1/2}\int_0^1 \frac{x}{\sqrt{1-x^2y^2}}\ dy\ dx$.

(OR)

b) Solve $\int_0^2\int_1^3\int_1^2 xy^2z\ dz\ dy\ dx$.

21. a) Find the unit normal vector to the surface $x^3 - xyz + z^3 = 1$ *at* $(1,1,1)$.

(OR)

b) Prove that $curl(f+g) = curl\ f + curl\ g$.

22. a) Verify Green's theorem for the function $f = (x^2+y^2)i - 2xyj$ *and* c is the rectangle in the $x-y$ plane bounded by $y=0,\ y=b,\ x=0$ $x=a$.

(OR)

b) Evaluate $\iint\limits_S xy\ dydz + y^2 dzdx + yz\ dxdy$ where S is the surface

$x^2 + y^2 + z^2 = a^2$.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Expand $\cos^5\theta\ \sin^3\theta$ is a series of sines of multiples of θ.

24. *If* $y = \tan(x+y)$ Prove that $\dfrac{d^2y}{dx^2} = -\dfrac{2(1+y^2)}{y^5}$.

25. Evaluate $\iint\limits_D x^2y^2\ dx\ dy$ where D is the Circular disc $x^2 + y^2 < 1$.

26. *If* f is solenoidal, Prove that $Curl\ Curl\ Curl\ f = \nabla^4 f$.

27. Verify Gauss divergence theorem for $f = yi + xj + z^2k$ for the cylindrical region S given by $x^2 + y^2 = a^2$, $z = 0$ *and* $z = h$.

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05AT31

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Allied Subject : Third Semester : Paper – I

PROGRAMMING IN C

Under CBCS – Credit 3

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The format identifier '%i' is also used for ____________ data type?

   a) char b) int c) float d) double

2. A character variable can store only ____________________.

   a) 1 character b) 20 characters c) 254 characters d) 265 characters

3. A character array always ends with ____________________.

   a) null (\0) character b) question mark (?)

   c) full stop(.) d) exclamation mark(!)

4. The structure combines variables of _____________________.

   a) similar data types b) dissimilar data types

   c) unsigned data types d) signed data types

5. The output of the following code is:

```
main()
{
int a[10], i;
for (i = 1; I <= 0; i++)
{
scanf("%d", a[i]);
printf("%d", a[i]);
}
}
```

a) 10 b) Logical error
c) Runtime error d) 1 to 10 will be displayed

6. The variable which has been declared before the main is called ________________ variable.
   a) local b) global c) static d) auto
7. Valid variable name declaration from the following ______________
   a) char b) price$ c) First_tag d) First tag
8. The maximum length of a variable in C is _______________
   a) 8 b) 16 c) 31 d) 64
9. The function fopen() on failure returns___________________.
   a) 0 b) NULL c) 1 d) none of the above
10. What is sizeof In ‘C’?
    a) Operator b) Reserve Worf
    c) Both (A) and (B) d) Function

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Define Character Set.
12. What are Constants?
13. Write a Syntax of Conditional operator.
14. Define GOTO Statement.
15. How to declare and initialize string variables in C?
16. What is a Function?
17. Comment on Pointers.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Discuss about different Data types in C with examples.

(OR)

b) Write Short Notes on : Type Conversions in Expressions.

19. a) Explain the use of if else and Nested if else Statement.

(OR)

b) Give the difference between While and Do-while Statement.

20. a) Discuss about One dimensional array declaration and initialization with example.

(OR)

b) Write a C program to Sort the given numbers using Array.

21. a) Write about Array within Structure with an example.

(OR)

b) Define and explain Unions in C.

22. a) Explain Opening and Closing file in C with example.

(OR)

b) Explain Random Access file in C.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Explain about Operators in C with example.
24. Describe about Switch statement with example.
25. Discuss in detail about String Handling functions.
26. Explain in detail about Categories of function with suitable example.
27. Describe Input / Output Operations in file with suitable illustrations.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : First Semester : Paper – I

ALGEBRA AND TRIGONOMETRY

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. If $x^4 + px^3 + qx^2 + rx + s = 0$ has roots as α, β, γ & δ then $\sum \alpha\beta\delta =$_________.

   a) –p b) – r c) s d) None

2. In an equation $x^n - 1 = 0$ has only 1 as real roots if n is _________.

   a) Odd b) even c) zero d) None

3. $\sum \alpha^2\beta\gamma = \sum \alpha\beta\gamma$ X $\sum \alpha$ - _____________.

   a) $\sum \alpha\beta^2$ b) $\left(\sum \alpha\right)^2$ c) $4\sum \alpha\beta\gamma\delta$ d) None

4. $\sum \alpha^3 =$ __________ - 9 $\sum \alpha^2\beta$

   a) $\left(\sum \alpha\right)^2$ b) $\sum \alpha\beta^2$ c) $\left(\sum \alpha\right)^3$ d) None

5. If the G.P roots are -6, 2, -2/3 where k =2, then the value of r is _____.

   a) – 2 b) 6 c) -1/3 d) None

6. If the roots of the equation is reduced by h, then x replaced by _____ in transformed equation.

   a) x – h b) x + h c) x/h d) None

7. The value of cosh(iπ/2) is _______ .

   a) 1 b) 0 c) – 1 d) None

8. The incorrect statement of the following is _______ .

a) sinh3x = 3sinhx + 4sinh^{3}x b) cosh 3x = 4cosh^{3}x – 3coshx

c) $\tanh 3x = \dfrac{3\tanh x - \tanh^3 x}{1+3\tanh^2 x}$ d) None

9. The value of cosh^{2}x + sinh^{2}x = ______.

a) $\dfrac{e^{2x}+e^{-2x}}{2}$ b) $\dfrac{e^{2x}-e^{-2x}}{2}$ c) $\dfrac{e^{2x}+e^{-2x}}{2i}$ d) None

10. If z is real then Log z is __________________.

a) Complex number b) real number

c) rational number d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Frame an Equation with rational co-efficient, one of whose roots is $-\sqrt{3}+\sqrt{-2}.$

12. Change the equation $2x^4-3x^3+3x^2-x+2=0$ into another, the co-efficient of whose highest term will be unity.

13. Find the quotient and remainder when $2x^6+3x^5-15x^2+2x-4$ is divided by $x+5.$

14. Find the nature of the roots of the equation $4x^3-21x^2+18x+20=0.$

15. Prove that $\cosh^2 x+\sinh^2 x=\cosh 2x.$

16. If $\sin(A+iB)=x+iy,$ prove that $\dfrac{x^2}{\cosh^2 B}+\dfrac{y^2}{\sinh^2 B}=1.$

17. Find $Log(1-i).$

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Solve the equation $8x^3-14x^2+7x-1=0$ whose roots are in geometrical progression.

(OR)

b) Find the sum of the cubes of the roots of the equation $x^5+x^2-x-1=0..$

19. a) Solve the equation $x^4+20x^3-143x^2+430x+462=0$ by removing its second term.

(OR)

b) If α,β,γ are the roots of the equation $x^3+px^2+qx+r=0,$ find the value of $(\alpha^2+1)(\beta^2+1)(\gamma^2+1).$

20. a) State and prove Rolle's theorem.

(OR)

b) Discuss the reality of the roots of $x^4+4x^3-2x^2-12x+\alpha=0$ for all real values of $\alpha.$

21. a) Expand $\dfrac{\sin 7\theta}{\sin\theta}$ in terms of $\sin\theta.$

(OR)

b) If $\tan A=\tan\theta\tanh\beta, \tan B=\cot\alpha\tanh\beta$ prove that $\tan(A+B)=\sinh 2\beta\, \mathrm{cosec}\, 2\alpha.$

22. a) If $\log\sin(\theta+i\phi)=A+iB,$ show that $2e^{2A}=\cosh 2\phi-\cos 2\theta.$

(OR)

b) Reduce $(\alpha+i\beta)^{x+iy}$ to the form $A+iB.$

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. i) If the sum of two roots of the equation $x^4+px^3+qx^2+rx+s=0$ equals the sum of the other two, prove that $p^3+8r=4pq.$

ii) If α,β,γ are the roots of the equation $x^3+px^2+qx+r=0,$ find the value of $\frac{\beta^2+\gamma^2}{\beta\gamma}+\frac{\gamma^2+\alpha^2}{\gamma\alpha}+\frac{\alpha^2+\beta^2}{\alpha\beta}.$

24. Solve the equation $6x^5-x^4-43x^3+43x^2+x-6=0.$

25. The equation $x^3-3x+1=0$ has a root between 1 and 2. Calculate it to three places of decimals using Horner's method.

26. i) Expand $\sin^3\theta\cos^5\theta$ in a series sines of multiples of $\theta.$

ii) If $\cos(x+iy)=\cos\theta+i\sin\theta,$ prove that $\cos 2x+\cosh 2y=2.$

27. If $\frac{-\pi}{2}<\theta<\frac{\pi}{2},$ find the sum to infinity of the series

$$1+\frac{1}{2}\cos 2\theta-\frac{1}{2.4}\cos 4\theta+\frac{1.3}{2.4.6}\cos 6\theta-..........$$

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05CT12

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : First Semester : Paper – II

DIFFERENTIAL CALCULUS

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The derivative of x^n is ________________

   a) nx^{n-1} b) x c) n! d) None

2. The value of $\cos^2x - \sin^2x$ is ______________

   a) sin2x b) – cos2x c) cos2x d) None

3. The derivative of cothx is ________________

   a) $-\text{cosech}^2x$ b) cosech^2x c) cosechx cothx d) None

4. The derivative of $\cosh^{-1}x$ is ________________

   a) $\frac{1}{1-x^2}$ b) $\frac{1}{\sqrt{1+x^2}}$ c) $\frac{1}{\sqrt{x^2-1}}$ d) None

5. The radius of curvature of a circle of radius r is ______________

   a) $\frac{1}{r}$ b) r c) $\frac{r}{4}$ d) $\frac{r}{2}$

6. The formula for length of the subtangent is _______________

   a) yy_1 b) $\frac{y}{y_1}$ c) $\frac{y_1}{y}$ d) None

7. The polar subnormal is ________________

   a) $r^2\frac{dr}{d\theta}$ b) $\frac{dr}{d\theta}$ c) $\frac{d\theta}{dr}$ d) None

8. The chord of curvature of the curve y = f(x) parallel to x axis is _______________

   a) 2ρ cos ψ b) 2ρ sin ψ c) 2ρ tan ψ d) None

9. Any point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is _____________

   a) (a cosθ , b sinθ) b) (a secθ , b tanθ)

   c) (a tanθ, b secθ) d) None

10. If x = sin θ, then $3x-4x^3$ is _______________

    a) Sin 3θ b) Sin 2θ c) Cos 3θ d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. If x=at^2,y=2at find $\frac{dy}{dx}$.
12. Find cosh^{2}x- sinh^{2}x.
13. Find if y= e^{ax}, then find y$_n$.
14. For the cycloid x= a (1- cosθ), y=a(θ+ sinθ) find $\frac{dy}{dx}$.
15. In the parabola y^2=4ax find sun tangent and sub normal.
16. Write the formula of the coordinates of the centre of curvature.
17. If $u=\frac{xy}{x+y}$ then find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=u$.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) If $x(1+y)^{\frac{1}{2}}+y(1+x)^{\frac{1}{2}}=0$ prove that $\frac{dy}{dx}=\frac{-1}{(1+x)^2}$.

    (OR)

    b) If x= a (θ-sin θ) y= a(1- cosθ) find $\frac{dy}{dx}$.

19. a) Prove that if y=sin(m sin^{-1}x) then (1-x^2)y$_2$-xy$_1$+m^{2}y=0.

    (OR)

    b) Find the nth differential coefficient of x^{2}logx.

20. a) Find the angle at which the radius vector cuts the curve $\frac{l}{r}=1+e\cos\theta$.

    (OR)

    b) Find the slope of the tangent with the initial line for the cardioid r= a (1-cos θ) at $\theta=\frac{\pi}{6}$.

21. a) What is the radius of curvature of the curve x^4+y^4=2 at the point (1,1)?

    (OR)

    b) Prove that the $(p-r)$ equation of the cardioid $r=a(1-\cos\theta)$ is $p^2=\frac{r^3}{2a}$.

22. a) State and prove Euler's theorem.

    (OR)

    b) Illustrate the theorem that $\frac{\partial^2 u}{\partial x\partial y}.=\frac{\partial^2 u}{\partial y\partial x}$ where u is equal to $\log\frac{x^2+y^2}{xy}$.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Differentiate $y=x\frac{\sqrt{a^2-x^2}}{2}+\frac{a^2}{2}\sin^{-1}\frac{x}{a}$.
24. Find the nth differential coefficient of cosx cos2x cos3x.
25. Find the envelope of the circles drawn on the radius vectors of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ as diameter.
26. Show that in the parabola y^2=4ax at the point t, $\rho=-2a(1+t^2)^{\frac{3}{2}}$, X=2a+3at^3, Y=-2at^3. Deduce the equation of the evolute.
27. If $u=\tan^{-1}\frac{x^3+y^3}{x-y}$ prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : Third Semester : Paper – I

DIFFERENTIAL EQUATIONS

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The order of the differential equation $\sqrt{\frac{dy}{dx}+y}=\sin x$ is _________.

   a) 1 b) $\frac{1}{2}$ c) 2 d) 0

2. The integrating factor of Bernoulli's equation $\frac{dy}{dx}-y\tan x=\frac{\sin x\cos^2 x}{y^2}$ is _______________

   a) $\cos^3 x$ b) $\cos^2 x$ c) $\cos^4 x$ d) $\cos^7 x$

3. The general solution of $\left(D^2-4\right)y=0$ is ___________.

   a) $y=Ae^{2x}+Be^{-2x}$ b) $y=Ae^{4x}+Be^{-4x}$

   c) $y=Ae^{3x}+Be^{x}$ d) $y=Ae^{4x}+B$

4. The roots of the differential equation $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+4y=0$ is _______

   a) 1, 4 b) -1, -4 c) -1, 4 d) 1, -4

5. The general term of the Simultaneous differential equations of first order and first degree is ____________________

a) $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ b) $Pdx=Qdy=Rdz$

c) $\frac{dx}{1}=\frac{dy}{2}=\frac{dz}{4}$ d) $\frac{dx}{3}=\frac{dy}{4}=\frac{dz}{7}$

6. $L\{f(t)\}=$

a) $\int_0^\infty e^{-st}f(t)ds$ b) $\int_0^\infty e^{-st}f(t)dt$

c) $\int_s^\infty e^{-st}f(t)ds$ d) $\int_s^\infty e^{-st}f(t)dt$

7. The value of $L(\sin at)=$

a) $\frac{s}{s^2+a^2}$ b) $\frac{a}{s^2+a^2}$ c) $\frac{s}{s^2-a^2}$ d) $\frac{a}{s^2-a^2}$

8. The value of $L\left\{\frac{\sin at}{t}\right\}=$

a) $\cot^{-1}\left(\frac{s}{a}\right)$ b) $\cot^{-1}\left(\frac{a}{s}\right)$ c) $\tan^{-1}\left(\frac{s}{a}\right)$ d) $\tan^{-1}\left(\frac{a}{s}\right)$

9. The value of $L^{-1}F\left[(ks)\right]=$

a) $\frac{1}{k}f(tk)$ b) $\frac{1}{k}f(t+k)$ c) $\frac{1}{k}f(t-k)$ d) $\frac{1}{k}f\left(\frac{t}{k}\right)$

10. The solution containing as many arbitrary constants as there are independent variables is called ____________________

a) Complete integral   b) Singular integral

c) Particular integral   d) General integral

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Solve $y\,dx-x\,dy+3x^2y^2e^{x^3}dx=0$.

12. Solve $x\,dy-y\,dx=\sqrt{x^2+y^2}dx$.

13. Find complementary function of $\left(D^3-3D^2+4\right)y=0$.

14. Find particular integral of $\left(D^2-2mD+m^2\right)y=e^{mx}$.

15. Write the standard form for a pair of ordinary simultaneous equations of the first order.

16. Find $L\left[\sin^2 2t\right]$.

17. Eliminate the arbitrary function from $z=f\left(x^2+y^2\right)$.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Solve $\frac{dy}{dx}-y\tan x=\frac{\sin x\cos^2 x}{y^2}$.

(OR)

b) Solve $\frac{dy}{dx}+y\cos x=\frac{\sin 2x}{2}$.

19. a) Solve $\left(D^2+5D+6\right)y=e^x$.

(OR)

b) Solve $\left(D^3-D^2-D+1\right)y=1+x^2$.

20. a) Solve the equations $\frac{dx}{yz} = \frac{dy}{xz} = \frac{dz}{xy}$.

(OR)

b) Solve the equation $\frac{dx}{-y^2 - z^2} = \frac{dy}{xy} = \frac{dz}{xz}$.

21. a) Find $L\left[t\, e^{-t} \sin t\right]$.

(OR)

b) Find $L-1\left[\frac{s+2}{\left(s^2+4s+s\right)^2}\right]$.

22. a) Eliminate f *and* φ from the relation $z = f\left(x+ay\right)+\varphi\left(x-ay\right)$.

(OR)

b) Solve $p\left(1+q^2\right) = q\left(z-1\right)$.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Solve $\frac{dy}{dx} - y\tan x = \frac{\sin x \cos^2 x}{y^2}$.

24. Solve $\left(D^2 - 4D + 3\right)y = \sin 3x \cos 2x$.

25. Solve $\frac{d^2y}{dx^2} + y = \sec x$.

26. Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$.

27. Solve $px\left(y^2+z\right) - qy\left(x^2+z\right) = z\left(x^2 - y^2\right)$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : Third Semester : Paper – II

NUMERICAL METHODS

Under CBCS – Credit 4

Time: **3** Hours | Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Choose the algebraic equation from the following ________________.

   a) $x^2 + x + 1 = 0$ b) $3x + \sin x + 2 = 0$

   c) $\log x + \sin x + 2 = 0$ d) $2e^x + \sin x + x^2 = 0$

2. Some methods yield the required result after some computations which can be specified in advance. Such methods are called ______________ method.

   a) Indirect b) Direct c) Iteration d) None

3. With standard notation the correct statement is __________________

   a) $\Delta = E - 1$ b) $\nabla = 1 + E^{-1}$ c) $D = h \log E$ d) None

4. $x^{(n)}$ is a polynomial with leading coefficient ________________.

   a) 2 b) 3 c) 1 d) None

5. $E^M \; E^n =$ _______________.

   a) $E^{m/n}$ b) E^{m+n} c) E^{m-n} d) None

6. Newton's forward interpolation formula is used to interpolate the value of y ______________.

   a) Near the beginning b) Near the end

   c) Near the middle d) None

7. If $f(x)=\frac{1}{x^2}$, the first divided difference $[a,b]=$ ______________.

a) $\frac{a^2b^2}{(a+b)}$ b) $-\frac{a^2b^2}{(a+b)}$ c) $\frac{(a+b)}{a^2b^2}$ d) None

8. $\frac{1}{h^2}\left[\nabla^2 y_n+\nabla^3 y_n+\frac{11}{12}\nabla^4 y_n+------\right]=$ ________________.

a) $\left(\frac{dy}{dx}\right)_{x=x_n}$ b) $\left(\frac{d^2y}{dx^2}\right)_{x=x_n}$ c) Zero d) None

9. $\int_{x_0}^{x_n} f(x)\,dx=\frac{h}{3}\left[(y_0+y_n)+2(y_2+y_4+-----)+4(y_1+y_3+-----)\right]$

is called __________________________.

a) Trapezoidal rule b) Simpson's $1/3$ rule

c) Simpson's $3/8$ rule d) None

10. _________________ method are called step methods.

a) Runge – kutta b) Milnes c) Picards d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Write Newton's Raphson formula to obtain the cube root of N.
12. Define dioganolly dominant matrix.
13. Find the n^{th} difference of e^x.
14. Recall the definition of the shift operator and the inverse operator.
15. Tell Stirling's formula.
16. Which equation is kwon as the Weddle's rule.
17. What is mean by Predictor and Corrector.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Use Aitken's Δ^2 method find the real root lying between 1 and 2 of the equation $x^3-3x+1=0$.

(OR)

b) Explain Bisection method.

19. a) Show that $\Delta\tan^{-1}\left[\left(\frac{n-1}{n}\right)\right]=\tan^{-1}\left[\left(\frac{1}{2n^2}\right)\right]$.

(OR)

b) Summarize the working rule to find C.F of the difference equation $\left(a_0E^r+a_1E^{r-1}+........+a_{r-1}E+a_r\right)y_n=f(n)$.

20. a) Extend the function y(x) to the derivatives using Newton's Backward difference formula.

(OR)

b) Show that $y'(x)=2x^3-\frac{21}{2}x^2+28x-11$ for the given data

x	0	1	2	3	4
$y(x)$	1	1	15	40	85

21. a) Use Weddle's rule to show that $\int_0^1 \frac{dx}{1+x}=0.69320$.

(OR)

b) Describe the trapezoidal rule.

22. a) Illustrate Picard's method.

(OR)

b) Solve $\frac{dy}{dx}=1-y,\ y(0)=0$ using Euler's method and find y at $x=0.1$ *and* $x=0.2$. Compare the result with the results of the exact solution.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Solve the following system of equations using Gauss Seidel Iteration method $6x+15y+2z=72;\ x+y+54z=110;\ 27x+6y-z=85.$

24. Apply Lagrange's Interpolation formula to fit a polynomial for the following data

x	0	1	3	4
y	– 12	0	6	12

Find the value of y when $x=2.$

25. The population in millions of a certain town is shown in the following table . Construct the rate of growth of the population in 1961.

Year x	1931	1941	1951	1961	1971
Population y	40.62	60.80	79.95	103.56	132.65

26. The velocity v of a particle at distance s from the point on it's path is given by the table below.

s *in meters*	0	10	20	30	40	50	60
n *in* $m/_{sec}$	47	58	64	65	61	52	38

Estimate the time taken to travel $60\ meters$ by using Simpson's $\frac{1}{3}$ rule

27. Solve using fourth order Runge – Kutta method $\frac{dy}{dx}+\frac{y}{x}=\frac{1}{x^2};\ y(1)$

Evaluate the value of y when $x=1.1.$

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : Fifth Semester : Paper – I

STATISTICS

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Regression coefficients are independent of the change of _________ but dependent on change of ____________.
   a) Origin, Scale b) Scale, Origin c) Axis, Mean d) None
2. If the two variables deviate in the opposite direction, the correlation is said to be
   a) Perfect b) direct c) inverse d) None
3. If A and B are _____________ events, P (AUB) = P(A)+P(B)
   a) Disjoint b) different c) separate d) None
4. If F(x) is a distribution function and if a<b then P(a < X < b) is
   a) F(b) + F(a) b) F(a) – F(b) c) F(b) – F(a) d) None
5. At t=0, the value of $\frac{d^r}{dt^r}\left(M_X(t)\right) =$ ___________.
   a) μ_r b) μ_r^1 c) μ^1 d) None
6. If X is a B(n,p), then the mean value is
   a) npq b) nq c) np d) None
7. The Characteristic function of Poisson distribution is
   a) $e^{\lambda(e^{it}-1)}$ b) $e^{\lambda(e^{it}+1)}$ c) $e^{\lambda t(e^{it}+1)}$ d) None
8. For the normal distribution, the Q.D, M.D & S.D are in the ratio
   a) 10:12:15 b) 10:11:12 c) 5:6:7 d) None

9. __________ confidence limits for μ is $\left(\bar{x}-\frac{s.t_{.01}}{\sqrt{n-1}}, \bar{x}+\frac{s.t_{.01}}{\sqrt{n-1}}\right)$

a) 98% b) 99% c) 97% d) None

10. In χ^2 test, the sample variance is ____________.

a) σ^2 b) S^2 c) N^2 d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Prove that $-1 \le \gamma \le 1$.

12. Prove correlation coefficient is the geometric mean between the regression coefficients.

13. *If* A *and* B are events of a sample space S such that $A \subseteq B$ then $P(A) \le P(B)$.

14. *If* A *and* B are two events with $P(A)=0.4$, $P(B)=0.3$ *and* $P(A \cap B)=0.2$. Find the probability of the events $A \cup B$.

15. Define Poisson distribution.

16. Define normal distribution.

17. A random sample of size 25 from a population gives the sample standard deviation 8.5. Test the hypothesis that the population standard deviation is 10.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Find the rank correlation coefficient between the height in c.m and weight in kg of 6 soldiers in Indian Army.

Height	165	167	166	170	169	172
Weight	61	60	63.5	63	61.5	64

(OR)

b) Prove that arithmetic mean of the regression coefficients is greater than or equal to the correlation coefficient.

19. a) Prove *if* A, B, C are mutually independent events, then $A \cup B$ *and* C are independent events.

(OR)

b) Find the constant c so that $f(x)=\begin{cases} c\ x\ e^{-x} & if\ 0<x<\infty \\ 0 & otherwise \end{cases}$.

20. a) In a binomial distribution the mean is 4 and the variance is 8/3. Find mode of the distribution.

(OR)

b) Prove that mean of the poisson distribution is λ.

21. a) A random sample of 10 bots has the following I.Q. 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100?

(OR)

b) Test the equality of s.ds for the data given below at 5% level of significance $n_1=10$, $n_2=14$, $s_1=1.5$, $s_2=1.2$.

22. a) Test the hypothesis that $\sigma=8$ given that $s=10$ for a random sample of size 51.

(OR)

b) Prove that $\psi^2=\sum_{i=1}^{k}\frac{(0_i-E_i)}{E_i}=\sum_{i=1}^{k}\frac{0_{i^2}}{E_{i^2}}-n$ where there are k set of theoretical and observed values with the total frequency n.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Show that the variables $u = x\cos\alpha + y\sin\alpha$ *and*

$$v = y\cos\alpha - x\sin\alpha \text{ are uncorrelated if } \alpha = \frac{1}{2}\tan^{-1}\left(\frac{2\gamma xy^{\sigma}x^{\sigma}y}{\sigma x^2 - \sigma y^2}\right). \ \alpha$$

24. Obtain the i) mean ii) median and iii) mode for the following distribution

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

25. A set of examination marks is approximately distributed with a mean 75 and S.D. of 5. If the top 5% of students get grade A and bottom 25% get grade B what mark is the lowest A and what mark is the highest B?

26. Two random sample gave the following result.

Sample	Size	Sample mean	Sum of square of deviation from the mean
I	10	15	90
II	12	14	108

Test whether the sample could have come from the same normal population.

27. Five coins are tossed 320 times. The number of heads observed is given below. Examine whether the coin is unbiased.

No. of heads	0	1	2	3	4	5	Total
Frequency	15	45	85	95	60	20	320

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019
Part – III : Core Subject : Fifth Semester : Paper – II

MODERN ALGEBRA
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Let A={blood,sky}.B={red,blue,green}; Define a relation ρ from A to B as aρb⇔the colour of a is b. Then ρ = ______________
   a) {(blood,blue),(blood,red)}
   b) {(blood,red),(sky,blue)}
   c) {(red,blood),(blue,sky)}
   d) {(blood,red),(blood,blue),(blood,green)}
2. Let A be a finite set of size n. The number of element in the power set of $A \times A$ is _____________
   a) 2^{2n} b) $(2n)^2$ c) 2^{n2} d) $2n^2$
3. The function $f: R \to R$ defined by $f(x) = 3x$ is ______________.
   a) bijection b) 1-1 but not onto
   c) Not 1-1 but onto d) Neither 1-1 nor onto
4. In (Z7, - {0}, Θ) the inverse of 3 is _______________
   a) 2 b) 3 c) 4 d) 5
5. The incorrect answer from the following choices is _______________
   a) (N,+) is an abelian group b) (Z,+) is an abelian group
   c) (Q,+) is an abelian group d) (R,+) is an abelian group

6. The incorrect statement from the following choices is ____________

In the set of even integers E define a*b=$\frac{ab}{2}$

a) * is a binary operation b) * is communitative

c) * is associative d) E has identity 1under *

7. The order of -1 in (R*, .) is ________________

a) 2 b) 1 c) 0 d) infinite

8. The number of cosets of the subgroup 3Z in (Z,+) is _______________

a) 2 b) .3

c) Infinite d) Cannot be determined

9. The number of automorphisms of a cyclic group of order n is _____

a) $\varphi(n)$ b) n c) n^2 d) 1

10. Let R a ring with identity. Then for all $a,b \in R$ we have __________

a) $(a+b)^2 = a^2 + ab + ba + b^2$ b) $(a-b)^2 = a^2 - 2ab + b^2$

c) $(a+b)(a-b) = a^2 - b^2$ d) $(a+b)^2 = a^2 + 2ab + b^2$

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Define equivalence relation.
12. Define cyclic group.
13. Show that in a group G, $x^2 = x$ if and only if x = e.
14. Define normal subgroup.
15. Let H be a subgroup of G. Let a$\in$G. Then aHa^{-1} is a subgroup of G.
16. Show that (Z_4,$\oplus$) is not isomorphic to V_4.
17. Let R be a ring with identity. Then S = {n.1 / n $\in$Z} is a subring of R.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) If ρ and σ are equivalence relations defined on a set S, prove that $\rho \cap \sigma$ is an equivalence relation.

(OR)

b) Let f: A→ B, g: B→C be two functions. Then

i) g of is 1-1 ⇒ f is 1-1. ii) g of is onto ⇒ g is onto.

19. a) Prove that a non-empty subset H of a group G is a subgroup of G iff a, b $\in$H ⇒$ab^{-1}\in$H.

(OR)

b) Prove that a subgroup of cyclic group is cyclic.

20. a) Let G be a group and a $\in$ G. Then the order of a is the same as the order of the cyclic group generated by a.

(OR)

b) If H is a subgroup of G and N is a normal subgroup of G then NH is a subgroup G.

21. a) Let f: G →G' be an isomorphism.Let a $\in$ G. then the order of a is equal to the order of f(a).

(OR)

b) Let G be any group and H be the centre of G. Then G / H ≅ I (G), the group of inner automorphisms of G.

22. a) Prove that Zn is an integral domain iff n is prime.

(OR)

b) Prove that a non-empty subset S of a ring R is a subring iff

$a, b \in S \Rightarrow a - b \in S$ and $ab \in S$.

SECTION – D

Answer any THREE Questions : **$(3 \times 10 = 30)$**

23. Let ρ be an equivalence relation defined on a set S. Then

    i) $a\rho b \Leftrightarrow [a] = [b]$.

    ii) Any two distinct equivalence classes are disjoint.

    iii) S is the union of all the equivalence classes.

24. Prove that any permutation can be expressed as a product of disjoint cycles.

25. State and prove Euler's theorem.

26. State and prove fundamental theorem of homomorphism.

27. Let R be any commutative ring with identity. Let P be an ideal of R. Then P is a Prime ideal $\Leftrightarrow$ R / P is an integral domain.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Core Subject : Fifth Semester : Paper – III

REAL ANALYSIS

Under CBCS – Credit 5

Time: **3** Hours | Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Let N={1,2,3…,n…} and E={2,4,6,…,2n,…}. The correct statement is ____________

   a) N and E are equivalent sets b) N and E are equal sets

   c) N and E are finite sets d) None

2. In the discrete metric space M the diameter of A = {1,5,7,9} is _____

   a) 0 b) 1 c) 9 d) 8

3. In R with usual metric let A =[0,1]. Then Int A = __________

   a) {0} b) {1} c) {0,1} d) (0,1)

4. In a metric space (M,d), let A, B $\subseteq$ M. The incorrect statement is ___

   a) $A \subseteq B \Rightarrow \overline{A} \subseteq \overline{B}$ b) $\overline{A \cup B} = \overline{A} \cup \overline{B}$ c) $\overline{A \cap B} \supseteq \overline{A} \cap \overline{B}$ d) $\overline{A \cap B} \subseteq \overline{A} \cap \overline{B}$

5. In a metric space (M,d) we have __________________

   a) $\overline{A \cup B} = \overline{A} \cup \overline{B}$ b) $\overline{A \cap B} = \overline{A} \cap \overline{B}$

   c) Int (AUB) = Int A U Int B d) $Int(A \cap B) \neq IntA \cap IntB$

6. Which of the following is an open set in R.

   a) (0,1) U (4,5) U [6,7) b) [0,1] U [4,5] U (6,7)

   c) (0,1) U (4,5) U (6,7) U (9, ∞) d) (0,1) U (4,5) U (6,7) {9}

7. In R with usual metric $\overline{IntQ}$ is ______________

a) Φ b) Q c) Q^c d) R

8. {[0,n) / n∈N} is an open cover for ____________

a) R b) N c) $[0,\infty)$ d) $(0,\infty)$

9. In a discrete metric space the only compact subsets are ____________

a) Finite sets b) singleton set

c) the whole set d) all proper subsets

10. The incorrect statement is __________________.

a) Any compact subset A of a metric space (M,d) is closed

b) Any compact subset A of a metric space (M,d) is bounded

c) If A and B are compact subsets of a metric space M then AUB is compact

d) R with usual metric is compact

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Define countable set. Give an example.

12. Define bounded set with example.

13. Prove that A is closed *iff* $A = \overline{A}$.

14. Prove that any finite subset of a metric space has no limit point.

15. Define homeomorphism.

16. *Let* $M = [1,2] \cup [3,4]$ with usual metric. Prove M is disconnected.

17. When will you say that a metric space is sequentially compact.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) *iff* $A = \overline{A}$. are countable sets, prove that *iff* $A = \overline{A}$. is also countable.

(OR)

b) Prove that in any metric space (M,d) each open ball is an open set.

19. a) *Let* (M,d) be a metric space. *Let* $A, B \subseteq M$. Prove that

i) $Int\ (A \cap B) = IntA \cap IntB.$

ii) $A \subseteq B \Rightarrow IntA \subseteq IntB.$

(OR)

b) Prove that in any metric space arbitrary intersection of closed sets in closed.

20. a) *Let* (M,d) be a metric space. Prove that any convergent sequence in M is a Cauchy sequence.

(OR)

b) Prove that the metric spaces $(0,1)$ *and* $(0,\infty)$ with usual metrices are homemorphic.

21. a) State and prove intermediate value theorem.

(OR)

b) *Let* (M,d) be a metric space. Prove that *if* M cannot be written as the union of two disjoint non-empty closed sets then M cannot be written as the union of two non-empty sets A *and* B such that $A \cap \overline{B} = \overline{A} \cap B = \varphi.$

22. a) Prove that a closed subspace of a compact metric space is compact.

(OR)

b) Prove that continuous image of a compact matric space is compact.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. State and Prove Minkowshi's Inequatity.

24. *Let* M be a metric space and M_1 a subspace of M. *Let* $A_1 \subseteq M_1$.

Then prove that A_1 open in M_1 *iff* there exists an open *set* A *in* M

such that $A_1 = A \cap M_1$.

25. State and prove Baire's category theorem.

26. Prove that a subspace of is connected iff it is an interval.

27. State and prove Heine Borel theorem.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019
Part – III : Core Subject : Fifth Semester : Paper – IV

STATICS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. If the forces P and Q are at right angles to each other their resultant is R=_________.
   a) P^2+Q^2 b) P^2-Q^2 c) $\sqrt{P^2+Q^2}$ d) None
2. The resultant of two equal forces bisects the ___________ between them.
   a) Distance b) angle c) force d) None
3. The _______________ of a couple is the product of either of the two forces of the couple and the perpendicular distance between them.
   a) Moment b) arm c) axis d) None
4. Like parallel forces act at the points A and B and the resultant act at C. Then C divides AB _______________.
   a) Externally b) internally c) in the ratio 2:3 d) none
5. A system of coplanar forces acting on a rigid body may be in equilibrium if the algebraic sum of the resolved parts of forces in some fixed direction must be _____________.
   a) Zero b) constant c) variable d) None
6. When O is the centroid of the ΔABC, then area of ΔBOC = _______.
   a) 2/3 ΔABC b) 1/3ΔABC c) ΔABC d) None
7. The range of friction is __________ to _________.
   a) 0, μR b) 0, μF c) 1, F d) None

8. The ______________ of a force in a direction is a variable quantity.

a) Component b) resolved part c) direction d) None

9. The length of the perpendicular from the foot of the ordinate on the tangent at any point of the catenary is __________________.

a) Variable b) constant c) vector d) None

10. With usual notation, the relation connecting y and ψ is ____________.

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

SECTION – B

Answer any FIVE Questions : **($5 \times 2 = 10$)**

11. State the converse of triangle of forces.
12. What do you mean by moment of a force about a point?
13. State two trigonometrical theorems.
14. DefineStatical friction.
15. Give the geometrical property of the common catenary.
16. State the condition of equilibrium of three coplanar parallel forces.
17. Define Coefficient of friction.

SECTION – C

Answer ALL Questions : **($5 \times 5 = 25$)**

18. a) State and prove Lami's theorem.

(OR)

b) Five forces acting at a point are represented in magnitude and direction by the lines joining the vertices of any pentagon to the midpoints of their opposite sides. Show that they are in equilibrium.

19. a) Two men carry a load of 224 kg wt, which hangs from a light pole of length 8m, each end of which rests on a shoulder of one of the men. The point from which the load is hung is 2m nearer to one man than the other. What is the pressure on each shoulder ?

(OR)

b) At what height from the base of a pillar must the end of a rope of a given length be fixed so that a man standing on the ground and pulling at its other end with a given force may have the greatest tendency to make the pillar overturn?

20. a) A heavy uniform rod of length 2a , rests partly within and partly without a smooth hemispherical bowl of radius r, fixed with its rim horizontal. If α is the inclination of the rod to the horizon, Show that $2r \cos 2\alpha = a \cos\alpha$.

(OR)

b) A heavy uniform sphere rests touching two smooth inclined planes one of which is inclined at 60^0 to the horizontal. If the pressure on this plane is one – half of the weight of the sphere, prove that the inclination of the other plane to the horizontal is 30^0 .

21. a) A particle of weight 30 kgs.resting on a rough horizontal plane is just on the point 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.

(OR)

b) A particle is placed on the outside of a rough sphere whose coefficient of friction is μ . 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.

22. a) A uniform chain of length l is to be suspended from 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 $\frac{1}{\sqrt{n^2-1}} \log\left(n+\sqrt{n^2-1}\right)$.

(OR)

b) The span of a suspension bridge is 100 mts and the sag at the middle of the chain is 10 mts. If the total load on each chain is 750 quintals, find the tension at the lowest point.

SECTION – D

Answer any THREE Questions : **($3 \times 10 = 30$)**

23. E is the middle point of the side CD of a square ABCD. Forces 16, 20, $4\sqrt{5}$, $12\sqrt{2}$ kg.wt.act along AB, AD, EA, CA in the directions indicated by the order of the letters. Show that they are in equilibrium.
24. State and prove Varigon's theorem.
25. A uniform rod , of length a, hangs against a smooth vertical wall being supported by means of a string , of length l, tied to one end of the rod, the other end of the string being attached to a point in the wall; show that the rod can rest inclined to the wall at an angle θ is given by $\cos^2\theta = \frac{l^2 - a^2}{3a^2}$.
26. A uniform ladder is in equilibrium with one end resting on the ground and the other against a vertical wall; if the ground and wall be both rough , the coefficients of friction being μ and μ' respectively , and if the ladder be on the point of slipping at both ends , show that θ, the inclination of the ladder to the horizon is given by tan $\theta = \frac{1-\mu\mu'}{2\mu}$.

    Find also the reactions at the wall and ground.
27. A uniform chain of length 2l hangs over two small smooth pegs in the same horizontal line and at a distance 2a apart. Show that , if h is the sag in the middle , the length of either part of the chain that hangs vertically is $h + l - \sqrt{2hl}$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – III : Elective Subject : Fifth Semester : Paper – I

LINEAR PROGRAMMING

Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. A feasible solution to an LPP
   a) must satisfy all of the problem's constraints simultaneously
   b) must be corner point of the feasible solution
   c) need not satisfy all of the constraints, only some of them
   d) must optimize the value of the objective function
2. An iso-profit line represents
   a) An infinite number of solutions all of which yield the same profit
   b) An infinite number of optimum solutions
   c) An infinite number of solutions all of which yield the same cost
   d) A boundary of feasible solutions
3. At any iteration of the usual Simplex method, if there is at least one basic variable in the basis at zero level and all $\left(z_j - c_j\right) \geq 0,$ the current solution is
   a) Infeasible b) Unbounded
   c) Non-degenerate d) Degenerate
4. In the context of LPP, which of the following is not correct?
   a) When the constraints are of '$\geq$' type, surplus variable are introduced to convert them into equations
   b) Artificial variables are no tangible relationship with the decision variables

c) Surplus variables cannot appear in the basis of the optimum solution to an LPP

d) An artificial variable can be dropped for further calculations once it becomes non-basic or gets removed at any stage

5. The coefficient in the objective function of a primal problem appears in the corresponding dual as

a) a coefficient in the objective function

b) a right hand side constant of a constraint in a dual problem

c) an input-output coefficient

d) none of the above

6. The number of primal variables is equal to the number of _________

a) dual variables b) dual constraints c) both a and b d) none of them

7. In Vogel's Approximation method

a) The cost difference indicate the penalties for not using the respective least cost routes

b) Initial solution to T.P is not applicable, if some routes are prohibited

c) Degeneracy never occurs

d) None of the above

8. All the ____________ for a T.P are triangular

a) variables b) sources c) destinations d) basis

9. In an assignment problem, destination is called

a) resources b) activity c) origin d) basis

10. While solving an assignment problem, an activity is assigned to a resource with zero opportunity cost because the objective is to

a) reduce the cost of assignment to zero

b) minimize total cost of assignment

c) reduce the cost of the particular assignment to zero

d) all the above

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Write the standard form of the L.P.P. :

$$Max\ Z = 2x_1 + x_2 + 4x_3, \quad \text{subject to the}$$

$$\text{Constraints : } -2x_1 + 4x_2 \le 4, \quad x_1 + 2x_2 + x_3 \ge 5.$$

$$2x_1 + 3x_3 \le 2.$$

12. Define degenerate solution.

13. Write the standare primal problem for maximigation type.

14. Obtain the dual of the following L.P.P. :

$$Max\ Z = 2x_1 + 3x_2 + 5x_3 \quad \text{subject to the}$$

$$\text{Constraints : } 4x_1 + 3x_2 + x_3 = 6, \quad x_1 + 2x_2 + 5x_3 = 4,$$

$$x_1, x_2, x_3 \ge 0.$$

15. Write the mathematical formulation of the transportation problem.

16. Write the dual of the general transportation problem

17. Write the mathematical formulation of the assignment problem.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Write the steps in mathematical formulation of a problem.

(OR)

b) Rewrite in standard form the following linear programming

$$\text{Problem : } Minimize\ \ Z = 2x_1 + x_2 + 4x_3 \quad \text{subject to the}$$

$$\text{Constraints : } -2x_1 + 4x_2 \le 4, \quad x_1 + 2x_2 + x_3 \ge 5,$$

$$2x_1 + 3x_3 \le 2, \quad x_1, x_2 \ge 0\ \ and\ \ x_3 \text{ unrestricted in sign.}$$

19. a) *Let* $x_1 = 2, \; x_2 = 4, \; x_3 = 1$ be a feasible solution in sign system of equations $2x_1 - x_2 + 2x_3 = 2, \;\; x_1 + 4x_2 = 18.$ Reduce the given fearible solution to a basic fearible solution.

(OR)

b) Use simplex method to solve

$$Minimize \;\; Z = 10x_1 + x_2 + 2x_3 \;\; \text{subject to the Constraints :}$$

$$x_1 + x_2 - 2x_3 \le 10, \;\; 4x_1 + x_2 + x_3 \le 20, \;\; x_1, x_2, x_3 \ge 0.$$

20. a) Formulate the dual of the following linear programming problem :

$$Max \;\; Z = 5x_1 + 3x_2, \;\; \text{subject to the Constraints :}$$

$$3x_1 + 5x_2 \le 15, \;\; 5x_1 + 2x_2 \le 10, \;\; x_1 \ge 0 \;\; and \;\; x_2 \ge 0.$$

(OR)

b) Write the dual of the L.P.P. :

$$Minimize \;\; Z = 4x_1 + 6x_2 + 18x_3 \;\; \text{subject to the Constraints :}$$

$$x_1 + 3x_2 \ge 3, \;\; x_2 + 2x_3 \ge 5 \;\; and \;\; x_1, x_2, x_3 \ge 0.$$

21. a) Obtain an initial basic fearible solution to the following T.P. using the matrix minima method :

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	8	6	10
Demand	4	6	8	6	

(OR)

b) Explain MODI method.

22. a) A company wishes to assign 3 job to 3 machines. The cost of assigning job i to machine j is given by the matrix below

Cost matrix : $\begin{pmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{pmatrix}$.

Draw the associated network. Formulate the network LPP.

(OR)

b) Solve the following assignment problem.

$$\begin{array}{cc|cccc} & & & \text{MEN} & & \\ & & A & B & C & D \\ & 1 & & & & \\ \text{Jobs} & 2 & & & & \\ & 3 & & & & \\ & 4 & & & & \end{array}$$

$$\begin{array}{cc} & \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{pmatrix} 10 & 25 & 15 & 20 \\ 15 & 30 & 5 & 15 \\ 35 & 20 & 12 & 24 \\ 17 & 25 & 24 & 20 \end{pmatrix} \end{array}$$

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Consider a small plant which makes two types of automobile parts, say A *and* B It buys castings that are machined, bored and polisked. The capacity of machining is 25 per hour for A *and* 40 per hour for B, capacity of boring is 28 per hour for A *and* 35 per hour for B, and the capacity of polisking is 35 per hour for A *and* 25 per hour for B.

    Casting for part A costs ₹ 2 each and for part B they cost ₹ 3 each. They sell for ₹ 5 and ₹ 6 respecctively. The 3 machines have running costs of ₹ 20, ₹ 14 and ₹ 17.50 per hour. Assuming that any combination of parts A *and* B can be sold, what product mix maximizes profit?

24. Use penality method to solve

    Maximize $Z = 3x_1 + 2x_2 + 3x_3$ subject to the Constraints :

    $$2x_1 + x_2 + x_3 \le 2,\ \ 3x_1 + 4x_2 + 2x_3 \ge 8,\ \ x_1, x_2, x_3 \ge 0.$$

25. Use dual simplex method to solve the following L.P.P. :

    Max $Z = -3x_1 - x_2$ subject to the Constraints :

    $$x_1 + x_2 \ge 1,\ \ 2x_1 + 3x_2 \ge 2,\ \ x_1, x_2 \ge 0.$$

26. Solve the following transportation problem :

FROM	TO A	TO B	TO C	Available
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirement	4	2	2	

27. Solve the following Assignment problem :

$$\begin{array}{cc} & \begin{array}{ccccc} V & W & X & Y & Z \end{array} \\ \begin{array}{c} A \\ B \\ C \\ D \\ E \end{array} & \begin{pmatrix} 3 & 5 & 10 & 15 & 8 \\ 4 & 7 & 15 & 18 & 8 \\ 8 & 12 & 20 & 20 & 12 \\ 5 & 5 & 8 & 10 & 6 \\ 10 & 10 & 15 & 25 & 10 \end{pmatrix} \end{array}$$

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.A. / B.Sc. Degree (Semester) Examinations, November 2019

Part – IV : Non-Major Elective Subject : First Semester : Paper – I

FUNDAMENTAL OF MATHEMATICS

Under CBCS – Credit 2

Time: **2** Hours　　　　　　　　Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. 1 +2+3+……………+n is equal to

   a) n^2　　b) 0　　c) n/2　　d) n(n+1)/2

2. In the ratio 3:2 = a:8 the value of a is

   a) 10　　b) 8　　c) 14　　d) 12

3. The slope of the straight line ax + by+ c=0 is

   a) c/a　　b) c/b　　c) b/a　　d) -a/b

4. Write the equivalent ratio for 32/96

   a) ½　　b) 1/3　　c) ¼　　d) 1/5

5. The fifth term in the G.P. 3, 6, 12…is

   a) 28　　b) 25　　c) 82　　d) 48

6. Find the duplicate of the ratio a:b is

   a) 8:27　　b) 4:9　　c) 5:1　　d) 25:10

7. The distance between (0, 0) and (6, 8) points is by a

   a) 5　　b) 10　　c) 20　　d) 30

8. Find the scalar matrix

a) $\begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$ b) $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ c) $\begin{pmatrix} 0 & 1 \\ 0 & 5 \end{pmatrix}$ d) $\begin{pmatrix} 1 & 0 \\ 0 & 5 \end{pmatrix}$

9. Find the identify matrix

a) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ b) $\begin{pmatrix} 0 & 0 & 1 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{pmatrix}$ c) $\begin{pmatrix} 0 & 2 & 1 \\ 1 & 0 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ d) $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

10. Find the diagonal matrix

a) $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 5 \\ 3 & 1 & 4 \end{pmatrix}$ b) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ d) None

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. How many times the ratio 3: 4 is the ratio 6:1?
12. Find the compound ratio of 2:3, 5:6 and 7:9.
13. Find the third proportional to 15 and 75.
14. If A=$\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ and B=$\begin{pmatrix} 2 & 0 \\ 1 & 5 \end{pmatrix}$ to find $A+B$.
15. If A=$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ and B=$\begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ to find $A-B$.
16. Find the mean proportional to 20 and 180.
17. Find the Distance between points $A(3,2)$ *and* $B(4,3)$.

SECTION – C

Answer ALL Questions : **(3 × 9 = 27)**

18. a) Find the value of x *if* $(3x+4):(4x+7)$ is the Duplicate ratio of 4:5.

(OR)

b) The present age of two brothers are in the ratio of 3:4 five years back their ages were in the ratio of 5:7 Find their present age.

19. a) Find the value of x when $(x+2):(x-3)=(x+8):(x-1)$.

(OR)

b) Check the parallelogram $A(8,0)$ *and* $B(4,0)$ $c(5,1)$ $d(9,1)$.

20. a) Find the quadratic equation of $2x^2+9x+10$.

(OR)

b) Findthe sum of series $51+52+53+\ldots\ldots\ldots\ldots+100$.

SECTION – D

Answer any TWO Questions : **(2 × 14 = 28)**

21. A and B can do piece of work in 10 days B and C in 15 days .C and A in 20 days all of them work at it for 2 days and then A leaves After 4 days of work B leaves. In how many days will C complete the remaining work?
22. If A=$\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$; B=$\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ & C=$\begin{pmatrix} 1 & 2 \\ 0 & 2 \end{pmatrix}$, find $A^2+B^2+2AB+2C$.
23. Show that the points $(8,-10)(7,-3)$ *and* $(0,-4)$ are the vertices of a right angled triangle.
24. Find the sum of series $21^2+22^2+\ldots\ldots\ldots\ldots+50^2$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – IV : Skill Based Subject : Third Semester : Paper – I

MATHEMATICAL LOGIC

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. $P \vee p \Leftrightarrow$ _____________.

   a) p b) q c) 0 d) 1

2. $P \vee 1 =$ _____________.

   a) 0 b) 1 c) P d) q

3. $P \wedge 1 =$ _____________.

   a) p b) q c) $\sim p$ d) $\sim q$

4. $P \vee o =$ _____________.

   a) 1 b) p c) o d) 1

5. $P \wedge \sim p =$ _____________.

   a) 1 b) P c) $\sim p$ d) 0

6. $P \vee \sim p$ _____________.

   a) P b) $\sim p$ c) 1 d) 0

7. $\sim (p \wedge q) =$ _____________.

   a) $\sim p \wedge \sim q$ b) $\sim p \vee \sim q$ c) $\sim p$ d) None

8. $p \vee (p \wedge q) =$ ______________.

a) 0 b) 1 c) p d) q

9. $p \wedge o =$ ______________.

a) 1 b) o c) $\sim p$ d) $\sim q$

10. $\sim (p \vee q) =$ ______________.

a) $\sim p \wedge q$ b) $\sim p \wedge \sim q$ c) o d) 1

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Write the Conditional law.
12. Write the Biconditional law.
13. Write the Commutative law.
14. Define Tautology.
15. Define Implication.
16. Write the Distributive law.
17. Write the Demorgan's law.

SECTION – C

Answer ALL Questions : **(3 × 9 = 27)**

18. a) i) Prove that $(p \to q) \Rightarrow (\neg q \to \neg p)$.

ii) Construct the truts table for $(p \wedge q) \wedge r$.

(OR)

b) Construct the truts table for i) $p \to (q \to r)$ ii) $p \to (q \wedge r)$

19. a) Construct the truts table a) $\sim (\sim p \vee \sim q)$ b) $\sim (\sim p \wedge \sim q)$

(OR)

b) Construct the truts table for i) $(p \wedge q) \vee r$ ii) $p \wedge (\sim q)$

20. a) Construct the truts table for i) $(p \wedge q) \to (p \vee q)$ ii) $\neg(\neg p \wedge \neg q)$

(OR)

b) Construct the truts table for

i) $(p \to q) \to (p \wedge r)$ ii) $(\sim p) \vee (\sim q)$

SECTION – D

Answer any TWO Questions : **(2 × 14 = 28)**

21. Construct the truts table for $(p \wedge q) \vee (q \wedge r) \vee (r \wedge p)$.
22. Construct the truts table for $(p \vee q) \vee (r \vee s)$.
23. Prove by law of duality

i) $\neg(p \wedge q) \to (\neg p \vee (\neg p \vee q)) \Leftrightarrow (\neg p \vee q)$.

ii) $(p \vee q) \wedge (\sim p \wedge (\sim p \wedge q) \Leftrightarrow (\neg p \wedge q))$.

24. Prove by Replacement process $(p \to q) \wedge (R \to q) \Rightarrow (p \vee R) \to q$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Mathematics Degree (Semester) Examinations, November 2019

Part – IV : Skill Based Subject : Fifth Semester : Paper – I

QUANTITATIVE APTITUDE

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. A does a work in 10 days and B does the same work in 15 days. In how many days they together will do the same work?

   a) 5 days b) 6 days c) 8 days d) 9 days

2. An athlete runs 200 metres race in 24 seconds. His speed is

   a) 20 kmph b) 24 kmph c) 28.5 kmph d) 30 kmph

3. In what time will a train 100 metres long across an electric pole, if its speed be 144 km/hr?

   a) 2.5 sec b) 4.25 sec c) 5 sec d) 12.5 sec

4. A train running at the speed of 60 km / hr crosses a pole in 9 seconds. What is the length of the train?

   a) 120 m b) 180 m c) 324 m d) None

5. What is the present worth of Rs. 132 due in 2 years at 5 % simple interest per annum?

   a) Rs.112 b) Rs.118.80 c) Rs.120 d) Rs.122

6. What will be compound interest on a sum of Rs.25,000 after 3 years at the rate of 12 p.c.p.a?

   a) Rs.9000.30 b) Rs.9720 c) Rs.10,123.20 d) Rs.10,483.20

7. The value of $\log_{343} 7$ is

a) $\frac{1}{3}$ b) -3 c) $-\frac{1}{3}$ d) 3

8. The value of $\log_{10} 0.0001$ is

a) $\frac{1}{4}$ b) $-\frac{1}{4}$ c) - 4 d) 4

9. On 6th March, 2005 Monday falls. What was the day of the week on 6th March, 2004?

a) Sunday b) Saturday c) Tuesday d) Wednesday

10. On 8th Feb, 2005 it was Tuesday. What was the day of the week on 8th Feb, 2004?

a) Tuesday b) Monday c) Sunday d) Wednesday

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. A is twice as good as workman as B and together they finish a work in 18 days. In how much days will A alone finish the work?

12. A cyclist covers a distance of 750 m in 2 min 30 sec. What is the speed in km/hr of the cyclist?

13. A train is moving at a speed of 132 km / hr. If the length of the train is 110 m, how long will it take to cross a railway platform 165 m long?

14. At what rate percent per annum will a sum of money double in 16 years?

15. In what time will Rs.1000 become Rs.1331 at 10% p.a compounded annually?

16. If $\log_{\sqrt{8}} x = 3\frac{1}{3}$, find the value of x?

17. If $\log_{10} 2 = 0.30103$; find the value of $\log_{10} 50$?

SECTION – C

Answer ALL Questions : **(3 × 9 = 27)**

18. a) A and B undertake to do a work for Rs. 600. A alone can do it in 6 days while B alone can do it in 8 days. With the help of C, they finish it in 3 days. Find the share of each?

(OR)

b) An aero plane flies along the four sides of a square at the speeds of 200, 400, 600 & 800 kmph. Find the average speed of the plane around the field?

19. a) A train 220 m long is running with a speed of 59 kmph. In what time with it pass a man who is running at 7 kmph in the direction opposite to that in which the train is going?

(OR)

b) A sum of Rs.800 amounts to Rs.920 in 3 years at simple interest. If the interest rate is increased by 3 %, it would amount to how much?

20. a) The difference between the compound interest & simple interest on a certain sum at 10% per annum for 2 years is Rs.631. Find the sum?

(OR)

b) Simplify : $\left(\log\frac{75}{16}-2\log\frac{5}{9}+\log\frac{32}{243}\right)$.

SECTION – D

Answer any TWO Questions : **(2 × 14 = 28)**

21. A and B can do a work in 18 days; B and C can do in 24 days; A and C can do in 36 days. In how many days will A, B and C finish it, working together and separately?
22. A train running at 54 kmph takes 20 seconds to pass a platform. Next it takes 12 seconds to pass a man walking at 6 kmph in the same direction in which the train is going. Find the length of the train and length of plat form?
23. The difference between compound interest and the simple interest accrued on an amount of Rs.18,000 in 2 years was Rs.405. What was the rate of interest p.c.p.a?
24. What was the day of the week on 15th August, 1947?

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