VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]

B.Sc. (Phy. / Chem.) Degree (Semester) Examinations, November 2018
Part – III : Allied Subject : Third Semester : Paper – I

MATHEMATICS – I
Under CBCS – Credit 5

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

SECTION – A

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

1. The derivative of cosecx is _____.
   a) –cosecxcotx b) cot x c) – cot x d)None
2. The derivative of sinhx is _____.
   a) – coshx b) coshx c) cosechx d) None
3. The derivative of $\tan^{-1}x$ is _____.
   a) $\frac{1}{\sqrt{1-x^2}}$ b) $\frac{-1}{\sqrt{1-x^2}}$ c) $\frac{1}{1+x^2}$ d) None
4. If $x = \tan\theta$ then $2x/(1+x^2)$ is
   a) $\sin 2\theta$ b) $\cos 2\theta$ c) $\tan 2\theta$ d) None
5. The value of $\int \sec^2 x dx$ is
   a) – tan x b) tanx c) sec x tan x d)None
6. The value of $\int \cot x dx$ is
   a) – cosec x b) cosec x c) log (sinx) d) None
7. The unit normal vector of a scalar point function φ is
   a) $|\nabla\phi|$ b) $\frac{\nabla\phi}{|\nabla\phi|}$ c) $\nabla\phi$ d)None
8. If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$, then $\frac{\partial r}{\partial z}$ is
   a) z/r b) – z / r c) z r d) None

9. The incorrect statement of the following is _____.

a) $\sinh 3x = 3\sinh x + 4\sinh^3 x$ b) $\cosh 3x = 4\cosh^3 x - 3\cosh x$

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

10. The expansion of tanhx = _____.

a) $\dfrac{\cosh x}{\sinh x}$ b) $\dfrac{-\sinh x}{\cosh x}$ c) $\dfrac{\sinh x}{\cosh x}$ d) None

SECTION – B

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

11. Write the expression of $\tan n\theta$.

12. Write the differentiation of $f(x) = \dfrac{u(x)}{\vartheta(x)}$.

13. State the condition for even function.

14. i) $\int \dfrac{dx}{x^2 - a^2} = ?$ ii) $\int \tan x dx = ?$

15. Write the value of $|r|$.

16. Define divergence of f.

17. Define surface integrals.

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) Solve approximately $\cos\left(\dfrac{\pi}{3} + \theta\right) = 0.49$.

19. a) *Let* $y = \tan^{-1}\left(\dfrac{2x}{1-x^2}\right) + \tan^{-1}\left(\dfrac{3x - x^3}{1 - 3x^2}\right) - \tan^{-1}\left(\dfrac{4x - 4x^3}{1 - 6x^2 + x^4}\right)$.

show that $\dfrac{dy}{dx} = \dfrac{1}{1+x^2}$.

(OR)

b) *If* $y = x^{x^x}$ Prove $\dfrac{dy}{dx} = yx^x\left(\dfrac{1}{x} + \log x + \log^2 x\right)$.

20. a) Show that $I = \int_0^{\pi/2} \dfrac{\sin x}{\sin x + \cos x}\, dx = \pi/4$.

(OR)

b) Prove that $\int_0^{\pi} x \log\sin x\, dx = \dfrac{\pi^2}{2}\log\left(1/2\right)$.

21. a) Prove that grad $grad(\phi\psi) = \phi grad\psi + \psi grad\phi$.

(OR)

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

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 $y = 0,\ y = b,$ $x = 0$ *and* $x = a$.

(OR)

b) Show that $\iint_S f.nds = \iiint_V a^2 dv$ where $r = \phi a$ *and* $a = \nabla\phi$ *and* $\nabla^2\phi = 0$.

SECTION – D

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

23. Prove that $\cos 8\theta = 128\cos^8\theta - 256\cos^6\theta + 160\cos^4\theta - 32\cos^2\theta + 1.$

24. Find the derivaties of the following functions with respect to x

i) $\sqrt{\left(\sin\left(\sqrt{x}\right)\right)}$ ii) $\log\left(\sin x\right)$ iii) $e^{\sin x}$ iv) $\sin e^x$ v) $\sin x^o$

25. Prove that $\int_0^{\pi/2} \log\sin x dx = \frac{\pi}{2}\log\left(1/2\right).$

26. i) Prove that $curl\left(r\times a\right) = -2a$ where a is a constant vector.

ii) Prove that $div\left(r\times a\right) = 0$ where a is a constant vector

27. Evaluate $\iint f.n\ ds$ where $f = \left(x^3 - yz\right)i - 2x^2yj + 2k$ *and* S_K is the surface of the cube bounded by $x = 0,\ y = 0,\ z = a,\ x = a,\ y = a$ *and* $z = a.$

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
Part – III : Allied Subject : Third Semester : Paper – I

PROGRAMMING IN C
Under CBCS – Credit 4

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

SECTION – A

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

1. Find the output of the following program.

   void main() { int i=05678; printf("%d", i); getch(); }

   a) 0289 b) 5678 c) 713 d) Syntax error

2. Standard ANSI C recognizes – number of keywords.

   a) 30 b) 32 c) 24 d) 36

3. Which header file is essential for using strcmp() function?

   a) string.h; b) strings.h; c) text.h; d) strcmp.h

4. The number of digits present after decimal in float is _____.

   a) 4 b) 1 c) 16 d) 6

5. strcat()function _____two strings.

   a) deletes b) concatenates

   c) compares d) none of the above

6. A multidimensional array A[10][9] can store ____ number of elements.

   a) 91 b) 88 c) 90 d) 89

7. Identity the Valid keyword in C from the following _____.

   a) Int b) int c) size of d) DOUBLE

8. The operator & is used for

   a) Bitwise AND b) Bitwise OR c) Logical AND d) Logical OR

9. What is the output of this C code?

```
int main()
{
    float a = 5.477777777777;
    printf("%f", a);
}
```

a) 5.477777 b) 5.477778 c) 5.478 d) 5.48

10. The Function name follows the same rule of formation as

a) Arrays b) constants c) Variables d) Strings

SECTION – B

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

11. State the logical operators in C.
12. Explain if...else statement.
13. Distinguish while and do...while statement.
14. List the common operations permormed on character strings.
15. List the elements of function definition.
16. Define slack byte.
17. Give any two rules of pointer operations.

SECTION – C

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

18. a) Explain about typedef keyword.

(OR)

b) Define Explicit conversion with example.

19. a) Write a C program to find the greatest among three numbers.

(OR)

b) Describe "for" loop.

20. a) How to declare one dimensional Array?

(OR)

b) Describe the Arithmetic operations on character.

21. a) Explain function Prototype.

(OR)

b) Explain the declaration of structure variable.

22. a) How to initialize the pointer variable?

(OR)

b) Give a note on chain of pointers.

SECTION – D

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

23. Explain scanf() function.
24. Elaborate Swith statement.
25. List the string handling functions.
26. Demonstrate nesting of fuctions.
27. Explain how to access a variable through its pointers.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. In an equation with real coefficients, _____ roots occur in pairs.
   a) real b) irrational c) imaginary d) None
2. In a transformation of equation, the reciprocal equation is derived by substituting x by _____.
   a) –x b) 1/x c) x^2 d) None
3. $\sum\alpha^2 = \left(\sum\alpha\right)^2$ - _____.
   a) $2\sum\alpha\beta$ b) $\sum\alpha\beta^2$ c) $\sum\alpha$ d) None
4. $\sum\alpha^2\beta^2$ = _____ - $2\sum\alpha^2\beta\gamma$ - $6\alpha\beta\gamma\delta$
   a) $\left(\sum\alpha\beta\right)^2$ b) $\left(\sum\alpha\right)^2$ c) $\sum\alpha\beta^2$ d) None
5. If α, β, γ & δ are the roots of the equation $x^4+px^3+qx^2+rx+s=0$ then $\sum\alpha\beta$ = _____.
   a) – p b) – r c) q d) None
6. If the roots of f(x) = 0 is multiplied by m, then the third term is multiplied by _____.
   a) m b) m^2 c) – m d) None
7. If $f^1(x) = 0$ has r real roots, then f(x) = 0 cannot have more than _____ roots.
   a) r b) r+1 c) r – 1 d) None
8. The value of cos (ix) = _____.
   a) icoshx b) – icoshx c) coshx d) None

9. 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

10. If z is purely real and positive then Log z has _____.

a) all values as complex numbers b) all values as real numbers

c) one real +ve value and all other complex d) None

SECTION – B

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

11. Find the equation with rational coefficients whose roots are $\sqrt{-1}-\sqrt{5}$.
12. If α,β,γ are the roots of the equation $x^3+px^2+qx+r=0$, express the value of $\sum\alpha^2\beta$ in terms of the coefficients.
13. Find the quotient and remainder when $3x^3+8x^2+8x+12$ is divided by $x-4$.
14. Find the nature of the roots of the equation $4x^3-21x^2+18x+30=0$.
15. Prove that $\cosh^2 x+\sin h^2 x=\cosh 2x$.
16. Find the logarithm of $x+iy$.
17. Find $Log(1-i)$.

SECTION – C

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

18. a) Solve the equation $6x^3-11x^2+6x-1=0$ whose roots are in harmonic progression.

(OR)

b) Calculate the sum of the cubes of the roots of the equation $x^4+2x+3=0$.

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) Show that the equation $3x^4-8x^3-6x^2+24x-7=0$, has one positive, one negative and two imaginary roots.

(OR)

b) Find the multiple roots of the equation $x^4-9x^2+4x+12=0$.

21. a) Express $\frac{\sin 6\theta}{\sin\theta}$ in terms of $\cos\theta$.

(OR)

b) If $\cosh u=\sec\theta$, show that $u=\log\tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right)$.

22. a) Find the value of $Log_{(-3)}(-2)$.

(OR)

b) If $\log\sin(\theta+i\emptyset)=L+iB$, prove that $2e^{2L}=\cosh 2\emptyset-\cos 2\theta$.

SECTION – D

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

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

iii) $\frac{1}{\alpha^2\beta^2}+\frac{1}{\beta^2\gamma^2}+\frac{1}{\gamma^2\alpha^2}$ iv) $\frac{\alpha\beta}{\gamma}+\frac{\beta\gamma}{\alpha}+\frac{\gamma\alpha}{\beta}$

24. Solve the equation $6x^5-x^4-43x^3+43x^2+x-6=0$.
25. Find the values of a for which $ax^3-9x^2+12x-5=0$ has equal roots and solve the equation in one case.
26. i) If $\cos\alpha\cdot\cosh\beta=\cos\emptyset$ & $\sin\alpha\cdot\sinh\beta=\sin\emptyset$, prove that $\sin\emptyset=\pm sin^2\alpha=\pm\sinh^2\beta$.

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

27. Sum to infinity the series $\cos\alpha+\frac{1}{2}\cos(\alpha+\beta)+\frac{1\cdot3}{2\cdot4}\cos(\alpha+2\beta)+\cdots$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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 secx is _____.

   a) secx tanx b) tanx c) $\tan^2 x$ d) None

2. The value of 1- $\coth^2 x$ is _____.

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

3. The derivative of $\cos^{-1} x$ is_____

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

4. If x = tanθ, then $\frac{2x}{1-x^2}$ is

   a) sin2θ b) cos2θ c) tan2θ d) None

5. The cartesian formula for the curvature is _____.

   a) $\frac{y_2}{(1+y_1^2)^{3/2}}$ b) $\frac{(1+y_1^2)^{3/2}}{y_2}$ c) $\frac{\sqrt{1+y_1^2}}{y_2}$ d) None

6. The radius of curvature in polar coordinates for the curve $r = f(\theta)$ is _____

   a) $\frac{\left(r_1^2 + r_2^2\right)^{\frac{3}{2}}}{r^2 + 2r_1^2 - rr_2}$ b) $\frac{\left(r^2 + r_1^2\right)^{\frac{3}{2}}}{r^2 + 2r_1^2 - rr_2}$ c) $\frac{\left(r^2 - r_1^2\right)^{\frac{3}{2}}}{r^2 + 2r_1^2 - rr_2}$ d) $\frac{\left(r^2 + r_1^2\right)^{\frac{3}{2}}}{r^2 - 2r_1^2 - rr_2}$

7. The evolute of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is _____.

a) another ellipse b) a four cusped cycloid

c) a parabola d) a circle

8. If z = f(u), where u = g(x,y) then $\frac{\partial z}{\partial x}$ is _____.

a) $\frac{dz}{du}.\frac{\partial u}{\partial x}$ b) $\frac{\partial z}{\partial x}.\frac{\partial x}{\partial u}$ c) $\frac{\partial z}{\partial u}.\frac{\partial u}{\partial x}$ d) None

9. The value of $D(a^x)$ is _____.

a) $x\,a^{x-1}$ b) $a^x \log_a e$ c) $a^x \log_e a$ d) None

10. For the curve r = f(θ), the angle φ between the radius vector & the tangent is given by tan φ is _____.

a) $r\frac{dr}{d\theta}$ b) $r\frac{d\theta}{dr}$ c) $\frac{1}{r}\frac{dr}{d\theta}$ d) None

SECTION – B

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

11. *If* $x=at^2;\ y=2at$ find $\frac{dy}{dx}$.

12. *If* $y=\left(2x^2+4\right)^3$ find $\frac{dy}{dx}$.

13. Find the n^{th} differential co-efficient of $(ax+b)^m$.

14. Show that, in the parabola $y^2=4ax$, the sub tangent at any point is double the abscissa.

15. Write the Cartesian formula for the radius of curvature.

16. Find the partial differential co-efficient of $n=\sin(ax+by+cz)$.

17. *If* x^3+y^3+3axy find $\frac{dy}{dx}$.

SECTION – C

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

18. a) $\frac{d}{dx}\left(\frac{\sqrt{x}}{2x+3}\right)$.

(OR)

b) *If* $y=\tan hx$. Find $\frac{dy}{dx}$.

19. a) Find y_n when $y=\frac{x^2}{(x-1)^2(x+2)}$.

(OR)

b) *If* $xy=ae^x+be^{-x}$. Prove that $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}-xy=0$.

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

(OR)

b) Find the envelope of the family of a straight lines $y+tx=2at+at^3$ the parameter being t.

21. a) Find the radius of curvature at any point of the cycloid $x=a(\theta+\sin\theta)$ *and* $y=a(1-\cos\theta)$.

(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) *If* $u=\tan^{-1}\frac{x^3+y^3}{x-y}$. Prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$.

(OR)

b) Find $\frac{du}{dt}$; *If* $u=x^3y^4z^2$ where $x=t^2\ \ y=t^3\ \ z=t^4$.

SECTION – D

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

23. i) Find $\frac{dy}{dx}$. *If* $x(1+y)^{1/2}+y(1+x)^{1/2}=0.$

ii) *If* $y=\sin h^{1}x.$ then $x=\sin hy.$

24. *If* $y=e^{a\sin^{-1}x}.$ Prove that $(1-x^2)y_2-xy_1-a^2y=0$ and show that

$(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+a^2)y_n=0.$

25. Find the envelope of the straight lines $\frac{x}{a}+\frac{y}{b}=1$ where the parameters are related by the equation $a^2+b^2=c^2$ where c is a constant.

26. Find the evolute of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1.$

27. *If* $u=r^n$ where $r^2=x^2+y^2+z^2.$ Show that

$$\frac{\partial^2u}{\partial x^2}+\frac{\partial^2u}{\partial y^2}+\frac{\partial^2u}{\partial z^2}=n(n+1)r^{n-2}.$$

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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 integrating factor of the differential equation $\frac{dy}{dx} + xy = e^{\frac{-x^2}{2}}$ is _____.

   a) $e^{\frac{-x^2}{2}}$ b) $e^{\frac{x^2}{2}}$ c) $-e^{\frac{-x^2}{2}}$ d) $-e^{\frac{x^2}{2}}$

2. In an Exact differential equation, when $Mx + Ny \neq 0$ and the equation is homogeneous _____ is an integrating factor of $Mdx + Ndy = 0$

   a) $\frac{1}{Mx+Ny}$ b) $\frac{-1}{Mx+Ny}$ c) $\frac{1}{Mx-Ny}$ d) $\frac{-1}{Mx-Ny}$

3. The auxiliary equation of $x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{1}{(1-x)^2}$ is

   a) $(m+1)^2 = 0$ b) $(m-1)^2 = 0$
   c) $(m+2)^2 = 0$ d) $(m-2)^2 = 0.$

4. The Particular integral of the differential equation $(D^2 - 4)y = sin\ 2x$ is _____.

   a) $\frac{\sin 2x}{-8}$ b) $\frac{\sin 2x}{8}$ c) $\frac{\sin 2x}{-14}$ d) $\frac{\sin 2x}{-12}$

5. One of the solution of the differential equation $\frac{dx}{y} = \frac{dy}{z} = \frac{dz}{x}$ is _____.

   a) $xy - z = c$ b) $zx - \frac{y^2}{2} = c$ c) $xy - \frac{z^2}{2} = c$ d) $yz - \frac{x^2}{2} = c$

6. The value of $L(e^{at}) =$

   a) $\frac{1}{s-a}$ b) $\frac{1}{-(s-a)}$ c) $\frac{1}{s+a}$ d) $\frac{1}{-(s+a)}$

7. The value of $L\{tf(t)\} =$

a) $\frac{d}{ds}F(s)$ b) $-\frac{d}{ds}F(s)$ c) $\frac{d}{ds}F(-s)$ d) $-\frac{d}{ds}F(-s)$

8. The value of $L^{-1}\{F(s+a)\} =$

a) $e^{at}L^{-1}F(s)$ b) $-e^{at}L^{-1}F(s)$ c) $e^{-at}L^{-1}F(s)$ d) $-e^{-at}L^{-1}F(s)$

9. In a partial differential equations, q denotes

a) $\frac{\partial z}{\partial x}$ b) $\frac{\partial z}{\partial y}$ c) $-\frac{\partial z}{\partial x}$ d) $-\frac{\partial z}{\partial y}$

10. In an equation $z = ax + by + a$, $p =$

a) a b) $-a$ c) b d) $-b$

SECTION – B

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

11. Check whether the given equation $\left(x^2-4xy+2y^2\right)dx+\left(y^2-4xy-2x^2\right)dy=0$ is exact or not.

12. Solve $\left(D^2+D+1\right)^2 y=0.$

13. Find the complementary function of $\left(D^3-3D^2+3D-1\right)y=x^2e^x.$

14. Solve $yz^2\left(x^2-yz\right)dx+zx^2\left(y^2-xz\right)dy+xy^2\left(z^2-xy\right)dz=0.$

15. Find $L\left(\cos t\cos 2t\right).$

16. Find $L^{-1}\left(\frac{s+1}{s^2+2s+2}\right).$

17. Form a differential equation from $z=f\left(\frac{y}{x}\right)$ by eliminating the arbitrary function f.

SECTION – C

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

18. a) Solve $\frac{dy}{dx}=\frac{x+2y-3}{2x+y-3}.$

(OR)

b) Solve $y'=xe^x$ given that $y=3$ when $x=1.$

19. a) Solve $\left(D^2-6D+13\right)y=2^x+5.$

(OR)

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

20. a) Solve $y''+y=\cos ecx$ by the method of variation of parameters.

(OR)

b) Solve $\frac{xdx}{y^2z}=\frac{dy}{xz}=\frac{dz}{y^2}.$

21. a) Find the inverse Laplace transform of $\log\left(\frac{s+a}{s+b}\right).$

(OR)

b) Find the Laplace transform of $\frac{1-e^t}{t}.$

22. a) Solve $4\left(1+z^3\right)=9\ z^4pq.$

(OR)

b) Solve $z=px+qy+p^2+q^2.$

SECTION – D

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

23. Solve $xy'+y=y^2\log x.$

24. Solve $x^2y''-xy'+4y=\cos\left(\log x\right)+x\sin\left(\log x\right).$

25. Solve $Dx+2x-3y=t,\ \ Dy-3x+2y=e^{2t}.$

26. Using Laplace transform Solve $xy''-\left(2+x\right)y'+3y=x-1.$

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

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. In iteration method, the condition for the convergence of the sequence to the root is

   a) $\varphi(x)=c$ b) $|\varphi'(x)|=1$ c) $|\varphi'(x)|<1$ d) $|\varphi'(x)|>1$

2. One root of $3x-1-\cos x=0$ lies is the interval _____.

   a) $\left(\pi/2,\pi\right)$ b) $\left(0,\pi/2\right)$ c) $\left(-\pi/2,0\right)$ d) None

3. Newton Raphson's iteration formula is _____.

   a) $x_n=x_0-\dfrac{f(x_n)}{f'(x_n)}$ b) $x_{n+1}=x_n-\dfrac{f(x_n)}{f'(x_n)}$

   c) $x_n=x_{n-1}-\dfrac{f'(x_n)}{f(x_n)}$ d) None

4. If the interval of differencing is unity then $\nabla^2 x^2$ is _____.

   a) $2x-1$ b) $2x+1$ c) 2 d) None

5. $\dfrac{E^{1/2}+E^{-1/2}}{2}=$ _____.

   a) μ b) δ c) D d) None

6. Gauss forward interpolation formula is used to interpolate the values of y for _____.

   a) $0<p<1$ b) $-1<p<0$ c) $-\frac{1}{2}<p<\frac{1}{2}$ d) None

7. First divided difference $[x_1, x_2] =$ _____.

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

8. Angular acceleration = _____.

a) $\frac{d^2\theta}{dt^2}$ b) $\frac{d\theta}{dt}$ c) $\frac{d^2s}{dt^2}$ d) None

9. The error is Simpson's $\frac{1}{3}$ rule is of order _____.

a) $\hbar^2$ b) $\hbar^3$ c) h^4 d) None

10. Euler's method is less efficient is practical problems, since it required _____ to be small.

a) x b) $\hbar$ c) p d) None

SECTION – B

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

11. Define : Algebraic Equation.

12. Define : Absolute Error.

13. Write Gauss forward interpolation formula.

14. Define : Interpolating polynomial.

15. Define : Numerical Differentiation.

16. Write Newton – Cote's quadrature formula.

17. Define : Initial value problem.

SECTION – C

Answer ALL Questions : (5 × 5 = 25)

18. a) Evalute $\sqrt{12}$ to four places of decimals by Newton – Raphson method.

(OR)

b) Solve the following system of equations by Gauss Jordan method.

19. a) Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$.

(OR)

b) *If* $y(75) = 246,\ y(80) = 202,\ y(85) = 118,\ y(90) = 40$ find $y(79)$ by using Newton's formula.

20. a) Find $y^1(x)$ given

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

(OR)

b) Explain the first derivatives using Newton's forward difference formula.

21. a) Explain Trapezoidal rule.

(OR)

b) Evaluate $\int_0^{\pi/2} \sin x dx$ by Simpson's $\frac{1}{3}$ rule dividing the range into six equal parts.

22. a) Using Taylor's method, find $y(0.1)$ from $\frac{dy}{dx} + 2xy = 1,\ \ y_0 = 0.$

(OR)

b) Using Euler's method solve $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2.$ Find $y(0.1).$

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. Given the values

x :	5	7	11	13	17
y :	150	392	1452	2366	5202

Evalute y_9 using i) Lagrange's formula.

ii) Newton's divided differences formula.

25. A rod is rotating in a plane. The following table gives the angle θ (radians) through which the rod has turned for various values of time t (seconds).

t :	0	0.2	0.4	0.6	0.8	1.0
θ :	0	0.12	0.49	1.12	2.02	3.20

Calculate the angular velocity & the angular acceleration of the rod when $\theta = 0.6$ seconds.

26. Evalue $\int_0^1 \frac{dx}{1+x}$ using i) Simpson's three eight rule.

ii) Weddle's rule. Take $h=\frac{1}{6}$ for all cases.

27. Compute $y(0.1)$ by Runge – kutta method of 4th order for the differential equation $\frac{dy}{dx} = xy + y^2,\ \ y(0)=1.$

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. Rank correlation is _____.
   a) $\rho = 1 - \frac{\sum (x-y)^2}{n(n^2-1)}$ b) $\rho = 1 - \frac{6\sum (x-y)^2}{n(n^2-1)}$
   c) $\rho = \frac{6\sum (x-y)^2}{n(n^2-1)}$ d)None
2. If γ =1 then the correlation perfect & _____.
   a) Negative b) positive c) equal d) None
3. In a sample space S, P(S) is
   a) 1 b) 0 c) -1 d) None
4. If A and B are any two events of a sample space S, then _____ $= P(B) - P(A \cap B)$
   a) $P(\bar{B} \cap A)$ b) $P(\bar{A} \cap B)$ c) $P(\bar{A} \cup B)$ d) None
5. $M_{x=a}(t)$ = ____ $M_x(t)$
   a) $e^{-t/a}$ b) e^{at} c) e^{-at} d) None
6. The value of $|\phi_x(t)|$ is
   a) 0 b) 1 c) <1 d) None
7. If X is a Poisson variate with parameter λ, then the mean value is
   a) λ b) λ^2 c) λ^2+2 d) None
8. If X is $N(\mu, \sigma^2)$ then the mean value is
   a) $\frac{2}{\sigma\sqrt{\pi}}$ b) $\frac{1}{\sqrt{2\pi}}$ c) $\frac{1}{\sigma\sqrt{2\pi}}$ d) None

9. If S_1 and S_2 are the standard deviates of the samples X_1& X_2 having the sizes n_1 & n_2 respectively, then _____ can be estimated by

$$\sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}}$$

a) σ b) μ c) β d) None

10. χ^2 Distribution has _____ degrees of freedom.

a) n b) n-1 c) n-2 d) None

SECTION – B

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

11. Prove that $\gamma = \pm\sqrt{bxy\ byx}$.
12. Define mutually disjoint events.
13. Define probability density function.
14. Compute the mode of a binormial distribution $B\left(7, \frac{1}{4}\right)$.
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 hyposthesis that the population s.d. 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) The two variables x *and* y have the regression lines

$3x + 2y - 26 = 0$ *and* $fx + y - 31 = 0$.

Find i) the mean value of x *and* y.

ii) the correlation coefficient between x *and* y.

iii) the variance of y if the variance of x is 25.

19. a) *If* A *and* B are independent events then prove $\overline{A}$ *and* $\overline{B}$ are independent events.

(OR)

b) Find the constant C so that $f(x) = \begin{cases} C\ x\ e^{-x} & if \\ 0 & otherwise \end{cases}$ $0 < x < \infty$ satisfies the conditions of p.d.f of the continuous r.v.x.

20. a) Six dice are thrown 729 times. How many times do you expect atleast 3 dice to show a five or six.

(OR)

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

21. a) A random sample of 10 boys has the following I.Q. 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these 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) The following table gives the number of train accidents in a country that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week.

Days :	Sun	Mon	Tue	Wed	Thur	Fri	Sat
No. of accidents :	20	18	13	23	26	11	15

SECTION – D

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

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

$\vartheta = y\cos\alpha - x\sin\alpha$ are uncorretated *if* $\alpha = \frac{1}{2}\tan^{-1}\left(\frac{2\gamma_{xy}\sigma_x\sigma_y}{\sigma_x^2 - \sigma_y^2}\right)$.

24. The contents of 3 runs are

urn I	:	1 white	3 red	2 black balls
urn II	:	3 white	1 red	1 black balls
urn III	:	3 white	3 red	3 black balls

Two balls are chosen from a randomly selected urn. If the balls are 1 white and 1 red ball what is the probability that they come from urn II.

25. Find the probability of getting between 3 heads to 6 heads in 10 tosses of a fair coin using

i) bionomial distribution

ii) the normal approximation to the bionomial distribution.

26. Two random samples drawn from 2 normal populations are given below. Test whether the populations have the same variance.

Sample I :	20	16	26	27	23	22	18	24	25	19	-	-	$n = 10$
Sample II :	17	23	32	25	22	24	28	6	33	33	20	27	$n = 2$

27. The theory predicts that the proportion of an object available in four groups A, B, C, D should be $9:3:3:1$. In an experiment among 1600 times of this object the numbers in the four groups were 882, 313, 287 and 118. Use ψ^2 – test to verify whether the experimental result supports the theory.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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 ρ be a relation on a collection of sets defined by
   AρB⇔A∩ $B = \varphi$. Choose the correct statement…
   a) ρ is reflexive and transitive b) ρ is symmetric and transitive
   c) ρ is an equivalence relation d) ρ is not reflexive
2. Let A={x}and B be any non-empty set then $|A^B|$= _____.
   a) 1 b) 0 c) ∞ d) |B|
3. Consider the function $f : R \to R^+$ defined by $f(x) = 3^x$ then f is _____.
   a) One one b) Onto
   c) One one and onto d) None of the above
4. The incorrect statement from the following is _____.
   a) Any cyclic group is abelian
   b) Any abelian group is cyclic
   c) Any abelian group satisfies the rule $(ab)^2 = a^2b^2$
   d) Any sub group of an abelian group is normal
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. In R* define $a * b=\frac{ab}{2}$. Then the inverse of a is _____.

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

7. "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 _____.

a) Cayley's theorem b) Lagrange's theorem

c) Euler's theorem d) Fermat's theorem

8. The cyclic subgroup of Z_{24} generated by 18 has order _____.

a) 4 b) 6 c) 9 d) None of these

9. The incorrect answer from the following choices is _____.

a) Any two group of order two are isomorphic

b) Any two group of order three are isomorphic

c) Any proper subgroup of $(Z,+)$ is isomorphic $(z,+)$

d) $(Q,+)\cong(Q^*,.)$

10. The characteristic of $(Z_7,\oplus,\otimes)$ is _____.

a) 7 b) ∞ c) 0 d) 2

SECTION – B

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

11. Find the equivalence relation induced by the partition $\{\{1\},\{2,3\},\{4\}\}$ of $s=\{1,2,3,4\}$.

12. Define generator of a group G.

13. Prove that in an abelian group $(ab)^2=a^2b^2$.

14. *Let* G be a finite group and H a subgroup of G. What is H *if*

i) $[G:H]=1$ ii) $[G:H]=|G|$.

15. Prove that the centre H of a group G is a normal subgroup of G.

16. State cayley's theorem.

17. Define characteristic of the ring R.

SECTION – C

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

18. a) Show that the union of two equivalence relations need not be an equivalence relation.

(OR)

b) *Let* $f:A\to B,\ g:B\to C$ bijections. Then prove that $gof:A\to C$ is also a bijection.

19. a) *If* H *and* K are subgroups of a group G then prove that $H\cap K$ is also a subgroup of G.

(OR)

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

20. a) *Let* G be a group and a be an element of order n in G. Then $a^m=e$ *iff* n divides m.

(OR)

b) M *and* N are normal subgroups of a group G such that $M\cap N=\{e\}$. Show that every element of M commutes with every element of N.

21. a) Prove that isomorphism preserves the order of each element in a group.

(OR)

b) *Let* $f:G\to G'$ be a homornophism. Then f is $1-1$ *iff* ker $f=\{e\}$.

22. a) Prove that a ring R has no zero – divisors iff cancellation law is valid in R.

(OR)

b) Prove that the intersection of two subrings of a ring R is a subring of R.

SECTION – D

Answer any THREE Questions : **(3 × 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 quivalence classes.

iv) The set of all equivalence classes forms a partition of S.

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

25. Prove that a group G has no proper subgroups if it is a cyclic group of prime order.

26. *Let* $f: G \to G'$ be an epimorphism *Let* K be the Kernal of f.

Then prove that $G/K \cong G'$

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

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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. The incorrect statement from the following statements is _____
   a) E= {2,4,6,…,2n,…}is a countable set b) Z is a countable set
   c) N is a countable set d) R is a countable set
2. In (R,d) the diameter of [0,1] $\cap$ [2,3] = _____.
   a) 0 b) $-\infty$ c) 4 d) 3
3. In R with usual metric IntQ = _____.
   a) N b) Z c) Q d) Φ
4. If A = {0,1,1/2,1/3,….,1/n,…} then the derived set of A denoted by D(A) is _____
   a) {1} b) {0} c) A d) {0,1}
5. The incorrect statement from the following is _____.
   a) R with usual metric is complete
   b) C with usual metric is complete
   c) l_2 is complete
   d) Any discrete metric space is not complete
6. Let M =[1,2] U [3,4] with usual metric. Let A = [1,2] . Then _____.
   a) A is both open and closed in M
   b) A is closed not open in M
   c) A is open but not closed in M
   d) A is neither open nor closed in M

7. Which of the following is a compact metric space with usual metric?

a) R b) (0,1) c) $[0,\infty)$ d) [0,1]

8. An open cover for $[0,\infty)$ with usual metric is _____.

a) $\{[0,1/n) / n \in N\}$ b) $\{[0,n) / n \in N\}$

c) $\{(0,1/n) / n \in N\}$ d) $\{(0,1/n) / n \in N\}$

9. Which of the following is a disconnected subset of R^2?

a) $\{(x,y) / x^2 + y^2 = 1\}$ b) $\{(x,y) / x = 0\}$

c) $\{(x,y) / x = 0 \text{ or } y = 0\}$ d) $\{(x,y) / x,y \in Q\}$

10. In the set R of real numbers the usual metric is defined as _____

a) d(x,y) = x – y b) d(x,y) = x + y

c) $d(x,y) = \sqrt{|x-y|}$ d) d(x,y) = |x – y|

SECTION – B

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

11. Define countably infinite set.

12. Define dense set.

13. Define accumulation point.

14. *Let* (M_1, d_1) *and* (M_2, d_2) be two metric spaces. Then prove that any constant function $f : M_1 \to M_2$ is continuous.

15. *Let* $f : M_1 \to M_2$ be a $1-1$ onto function. Then prove that f^7 is continuous *iff* f is an open map.

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

17. Prove that $\mathbb{R}$ with usual metric is not compact.

SECTION – C

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

18. a) In $\mathbb{R}$ define $d(x,y) = |x-y|$. Prove that d is a metric on $\mathbb{R}$.

(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* $A, B \subseteq M$. Then prove that

Int $A =$ Union of all open sets contained in A.

(OR)

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

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

(OR)

b) *Let* (M_1, d_1) *and* (M_2, d_2) be two metric spaces. Then prove that a function $f : M_1 \to M_2$ is continous *iff* $f^7(F)$ is closed in M_1 whenever F is closed in M_2.

21. a) *If* A *and* B are connected subsets of a metric space M *and if* $A \cap B \neq \phi$, then prove that $A \cup B$ is connected.

(OR)

b) State and prove the intermediate value theorem.

22. a) Prove that any compact subset A of a metric space M is bounded.

(OR)

b) Prove that a subset A of $\mathbb{R}$ is compact *iff* A is closed and bounded.

SECTION – D

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

23. Prove that *if* $p \geq 1$, $\left[\sum_{i=1}^{n} |a_i + b_i|^p\right]^{1/p} \leq \left[\sum_{i=1}^{n} |a_i|^p\right]^{1/p} + \left[\sum_{i=1}^{n} |b_i|^p\right]^{1/p}$

where $a_1, a_2, \ldots\ldots, a_n$ *and* $b_1, b_2, \ldots\ldots, b_n$ are real numbers.

24. *Let* (M, d) be a metric space. *Let* $A, B \subseteq M$. Then prove that

i) $A \subseteq B \Rightarrow \overline{A} \subseteq \overline{B}$ ii) $\overline{A \cup B} = \overline{A} \cup \overline{B}$ iii) $\overline{A \cap B} \subseteq \overline{A} \cap \overline{B}$

25. State and prove Baire's Category Theorem.

26. Prove that a subspace of $\mathbb{R}$ 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 2018
Part – III : Core Subject : Fifth Semester : Paper – IV

STATICS
Under CBCS – Credit 5

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

SECTION – A

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

1. The greatest resultant of two forces of magnitude F_1 and F_2 has magnitude _____.
   a) F_1+F_2 b) F_1/F_2 c) F_1F_2 d) None
2. ABCD is a quadrilateral and a force acting at a point are represented in magnitude and direction by AB, BC, CD and DA, the resultant is _____.
   a) $\overline{BA}$ b) $2\overline{BA}$ c) $2\overline{AB}$ d) None
3. The moment of a force about a point is a _____ quantity.
   a) Vector b) scalar c) greater d) None
4. The moment is _____ when the force will tend to rotate the body in anticlockwise direction.
   a) Negative b) positive c) zero d) None
5. If the algebraic sum of the moments of a systems of coplanar forces about each of three non-coplanar points in their plane be same in magnitude and sign, the system reduces to _____.
   a) Force b) couple c) force & a couple d) None
6. ABC is a given triangle, when O is the circum-centre of the triangle ABC if _____.
   a) $\angle BOC = 2\angle A$ b) $\angle BOC = 2\angle B$
   c) $\angle BOC = 2\angle C$ d) None
7. When the equilibrium is non-limiting F/R is _____.
   a) $<\mu$ b) $>\mu$ c) $= \mu$ d) None

8. The maximum value of the friction.

a) μ b) μR c) μ / R d) None

9. If a long chain is thrown over two smooth pegs and is in equilibrium the free end must reach the _____ of the catenary formed by it.

a) Vertex b) directrix c) latus rectum d) None

10. With usual notation, the relation between x and ψ is _____.

a) x = c log(secψ + tan ψ) b) x = c tan ψ

c) s = x tanψ d) None

SECTION – B

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

11. State the Parallelogram law of forces.
12. Two like parallal forces P *and* Q act on a rigid body at A *and* B respectively. *If* Q be changed to $\frac{P^2}{Q}$, show that the line of action of the resultant is the same as it would be if the forces were simply interchanged.
13. What constitutes a couple?
14. State the theorem on three coplanar forces.
15. What do you mean by a dynamical friction?
16. Define coefficient of friction.
17. Give the Cartesian equation to the catenary.

SECTION – C

Answer ALL Questions : (5 × 5 = 25)

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

(OR)

b) ABC is a given triangle. forces, P,Q,R acting along the lines OA,OB,OC are in equilibrium. Prove $P:Q:R=a:b:c$ *if* O is the orthocentre of the triangle.

19. a) Two men carry a load of $224kg.wt,$ which hangs from a light pole of length 8m each end of which rests on a shoulder of one of them. 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) ABC is an equilateral triangle of side a *and* $D.E.F$ divide the sides BC,CA,AB respectively in the ratio $2:1.$ Three forces each equal to pact at D,E,F perpendicularly to the sides and outward from the triangle. Prove that they are equivalent to a couple of moment $\frac{1}{2}$ Pa.

20. a) 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 given by $\cos^2\theta=\frac{l^2-a^2}{3a^2}.$

(OR)

b) Forces $3,2,4,5kgwt.$ act respectively along the sides AB,BC,CD *and* DA of a square. Find the magnitude of their resultant and the points where its line of action meets AB *and* $AD.$

21. a) A uniform sphere is held in equilibrium on a rough inclined plane of angle α by a force of magnitude $\frac{w}{2}\sin\alpha$ applied tangentially to its circumference, where w is the weight of the sphere. Prove that the force must act parallel to the plane and that the coefficient of friction must be not less than $\frac{1}{2}\tan\alpha.$

(OR)

b) A particle of weight $30kgs.$ resting on a rough horizontal plane is just on the point of motion when acted on by horizontal forces of $6kgwt.$ *and* $8kgwt.$ 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.

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 100mts and the sag at the middle of thachain is 10mts. If the total load on each chain is 750 quintals, find the greatest tension in each chain and tension at the lowest point.

SECTION – D

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

23. $ABCDEF$ is a regular hexagon and at A, act forces respresented by $\overline{AB}, 2\overline{AC}, 3\overline{AD}, 4\overline{AE}$ *and* $5\overline{AF}$. Show that the magnitude of the resultant is $AB.\sqrt{351}$ and that it makes an angle $\tan^{-1}\left(\frac{7}{\sqrt{3}}\right)$ with AB.
24. State and Prove Varigon's theorem.
25. A heavy uniform sphere rests touching two smooth inclined planes one of which is inclined at 60^o 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^o.
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. Show that the length of an endless chain which will hang over a circular pulley of radius "a" so as to be in contact with two – thirds of the circumference of the pulley is $a\left[\frac{3}{\log\left(2+\sqrt{3}\right)}+\frac{4\pi}{3}\right]$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
Part – III : Core 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 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. Non-negativity condition is an important component of LPP, because
   a) Variables are interrelated in terms of limited resources
   b) Value of variables make sense and correspond to real world problems
   c) Value of variables should remain under the control of decision-maker
   d) None of these
3. 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
4. Which of the following is not correct?
   a) Degeneracy in an LPP may arise at the initial stage
   b) A degeneracy solution can never be optimum
   c) Degeneracy may be a temporary phenomenon
   d) The Big-M method and the Two-Phase method do not require the same number of iteration for solving an LPP
5. The dual of the primal minimization LPP is
   a) a minimization LPP b) a maximization LPP
   c) both a and b d) none of them

6. Which of the following is correct?
   a) If the primal problem is in its standard form, dual variables will be non-negative
   b) Dual simplex method is applicable to an LPP, if initial basic feasible solution is not optimum
   c) Dual simplex method always leads to degenerate basic feasible solution
   d) If the number of primal variables is very small and the number of constraints is very large, then it is more efficient to solve the dual rather than the primal problem
7. The initial solution of a T.P can be obtained by applying any known method. However the only condition is that
   a) the solution must be optimum
   b) the solution should be non- degenerate
   c) the rim conditions are satisfied
   d) all the above
8. Which of the following is not correct?
   a) Multiple optimum solutions are indicated if there are multiple zeroes for u_i and v_j values
   b) For an optimum solution to a T.P, the u_i and v_j values represent the optimum values of the dual problem
   c) If each cost element in a T.P is increased or decreased by a constant amount, it will not effect the optimum solution to the problem
   d) A maximization T.P is first converted into a minimization one by subtracting each value of the given matrix from the large value
9. In an assignment problem, the values of $x_{ij} =$
   a) 0 b) 1 c) 2 d) 0 or 1
10. The method used for solving an assignment problem is called _____.
   a) MODI method b) reduced matrix method
   c) Hungarian method d) none of the above

SECTION – B

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

11. The managar of an oil refinery must decide on the optimum mix of two possible blending process of which the input and output production runs are as follows.

Process	Input		Output	
	Crude A	Crude B	Gasolin ×	Gasolin Y
1	6	4	6	9
2	5	6	5	5

The maximum amounts available of crudes *A and B* are 250 units and 200 units respectively Market demand shows that at least 150 units to gasolin X and 130 units of gasoline Y must be produced. The profits per production run from process 1 and process 2 are ₹4 and ₹5 respectively. Formulate the problem for maximising the profit.

12. Show that the following system of linear equations has a degererate solution $2x_1 + x_2 - x_3 = 2,\ 3x_1 + 2x_2 + x_3 = 3.$
13. *Let* $x_1 = 2,\ x_2 = 4$ *and* $x_3 = 1$ be a feasible solution to the system of equations $2x_1 - x_2 + 2x_3 = 2,\ x_1 + 4x_2 = 18$ Reduce the given feasible solution to a Basic feasible solution.
14. Write the steps involved in the formulation of a Primal – dual pair.
15. Formulate the dual of the following L.P.P.

Maximize $z = 5x_1 + 3x_2$ subject to the constraints

$3x_1 + 5x_2 \le 15,\quad 5x_1 + 2x_2 \le 10,\quad x_1 \ge 0\ \ \&\ \ x_2 \ge 0.$

16. Obtain an initial basic feasible solution to the following Transportation problem using the north-west corner rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

17. A department head has four tasks to be performed by three subordinates who differ in efficiency. The estimate of the time each subordinate would take a perform is given below in the matrix. How should he allocate the tasks one to each man so as to minimize the total man-hours?

Task	Men		
	I	II	III
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

SECTION – C

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

18. a) A company makes two kinds of leather belts. Belt A is a high quality belt and belt B is of lower quality. The respective profits are ₹4.00 and ₹3.00 per belt. Each belt of type A requires twice as much time as a belt of type B and if all belts were of type B, the company could make 1000 per day. The supply of leather is sufficient for only 800 belts per day (Both A and B combined) Belt A requires a fancy buckle and only 400 per day are available. There are only 700 buckles a day available for belt B. Determine the optimal product mix.

(OR)

b) Use graphical method to solve the L.P.P.

Maximize $z = 2x_1 + 4x_2$ subject to the constraints

$x_1 + 2x_2 \le 5, \quad x_1 + x_2 \le 4, \quad x_1, x_2 \ge 0 \quad$ *and* $\quad x_1, x_2 \ge 0.$

19. a) Find the maximum value of

$z = 107x_1 + x_2 + 2x_3$ subject to the constraints

$14x_1 + x_2 - 6x_3 + 3x_4 = 7$

$16x_1 + x_2 - 6x_3 \le 5, \quad 3x_1 - x_2 - x_3 \le 0$

$x_1, x_2, x_3, x_4 \ge 0.$

(OR)

b) Use penalty (or Big M) method to

Maximize $z = 6x_1 + 4x_2$ subject to the constraints

$2x_1 + 3x_2 \le 30, \quad 3x_1 + 2x_2 \le 24, \quad x_1 + x_2 \ge 3, \quad x_1 \ge 0$ *and* $x_2 \ge 0.$

Is the solution unique? If not give two different solutions.

20. a) Consider the L.P.P.

Maximize $z = 2x_1 + 4x_2 + 4x_3 - 3x_4$ subject to the constraints

$x_1 + x_2 + x_3 = 4, \quad x_1 + 4x_2 + x_4 = 8 \quad x_1, x_2, x_3, x_4 \ge 0.$

By using x_3 *and* x_4 the starting variables, the optimum table is given by.

Basis	Solution	x_1	x_2	x_3	x_4
x_3	2	$3/4$	0	1	$-1/4$
x_2	2	$1/4$	1	0	$1/4$
z	16	2	0	0	3

Write the dual problem and find its solution from the optimum primal table

(OR)

b) Use dual simplex method to solve the following L.P.P.

Minimize $z = 3x_1 + x_2$ subject to

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

21. a) Use Vogel's Approximation Method to obtain an initial basic feasible solution of the transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

(OR)

b) A Company manufacturing air–coolers has two plants located at Mumbai and Calcutta with a weakly capacity of 200 units and 100 units respectively. The company supplies air–coolers to its 4 showrooms situated at Ranchi, Delhi, Luckknow and Kanpur which have a demand of 75, 100, 100 and 30 units respectively. The cost of transportation per unit is shown the following table.

	Ranchi	Delhi	Lucknow	Kanpur
Mumbai	90	90	100	100
Calcutta	50	70	130	85

Plan the production programme so as to minimize the total cost of transportation.

22. a) A Company wishes to assign 3 jobs to 3 machines in such a way that each job is assigned to same machine and no machine works on more than one job. The cost of assigning job i to machine j is given by the matrix below.

Cost matrix : $\begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$ Draw the associated network.

Formulate the network L.P.Panel. Find the minimum cost of making the assignment.

(OR)

b) For the game with the following pay off matrix, determine the optimum strategies and the value of the game. $P_1\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}^{P_2}$

SECTION – D

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

23. Rewrite in standard form the following L.P.P.

Minimize $z = 2x_1 + x_2 + 4x_3$ subject to constraints

$-2x_1 + 4x_2 \le 4,\ \ x_1 + 2x_2 + x_3 \ge 5,\ \ 2x_1 + 3x_3 \le 2$

$x_1, x_2 \ge 0$ *and* x_3 unrestrictced in sign.

24. Use two – phase simplex method to

Maximize $z = 5x_1 - 4x_2 + 3x_3$ subject to the constraints

$2x_1 + x_2 - 6x_3 = 20,\ \ 6x_1 + 5x_2 + 10x_3 \le 76,\ \ 8x_1 - 3x_2 + 6x_3 \le 50,$

$x_1, x_2, x_3 \ge 0.$

25. Consider the L.P.P. *Maximize* $z = 3x_1 + 2x_2 + 5x_3$ subject to the constraints $x_1 + 2x_2 + x_3 \le a_1,\ \ 3x_1 + 2x_3 \le a_2,\ \ x_1 + 4x_2 \le a_3$ where a_1, a_2 *and* a_3 are constant. For specific values of a_1, a_2 *and* a_3 the optimal solution is

Basis	x_1	x_2	x_3	x_4	x_5	x_6	Solution
z	4	0	0	c_1	c_2	0	1,350
x_2	b_1	1	0	$\frac{1}{2}$	$-\frac{1}{4}$	0	100
x_3	b_2	0	1	0	$\frac{1}{2}$	0	c_3
x_6	b_3	0	0	-2	1	1	20

where bils and c_1's are constants Determine :

i) the value of a_1, a_2 *and* a_3 that yield the given optimal solution.

ii) the values of b_1, b_2, b_3 *and* c_1, c_2, c_3 in the optimal tableau.

iii) the optimal dual solution.

26. Consider the following transportation problem

Factory	Godowns						Stock available
	1	2	3	4	5	6	
A	7	5	7	7	5	3	60
B	9	11	6	11	---	5	20
C	11	10	6	2	2	8	90
D	9	10	9	6	9	12	50
Demand	60	20	40	20	40	40	

It is not possible to transport any quantity from factory B to Godown 5. Determine

a) Initial solution by Vogel's Approximation method

b) Optimum Basic Feasible solution

c) Is the optimum solution unique? If not, find the alternative optimum basic feasible solution.

27. Two firms are competing for business under the condition so that one firm's gain is another firm's loss. Firm A's pay off matrix is given below.

		Firm B		
		No ad	Medium ad	Heavy ad
Firm A	No advertising	10	5	-2
	Medium advertising	13	12	15
	Heavy advertising	16	14	10

Suggest optimum strategies for the two firms and the net outcome theoreof.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
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B.A. / B.Sc. Degree (Semester) Examinations, November 2018
Part – IV : Non-Major Subject : First Semester : Paper – I

FUNDAMENTALS OF MATHEMATICS
Under CBCS – Credit 2

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

SECTION – A

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

1. $5^4 / 5^2$ is equal to _____.
   a) 5^4 b) 4^5 c) 5^2 d) 125^2

2. The decimal value of the ratio $4:20$ is _____.
   a) 0.1 b) 0.2 c) 0.3 d) 0.4

3. The formula for the distance of straight line is _____.
   a) $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ b) $\frac{x_1+x_2+x_3}{3}$
   c) $\frac{xy}{2}$ d) $x+y$

4. The equation for the line with slope m & passes through (x_1, y_1) is _____.
   a) $ax+by+c=0$ b) $y=mx+c$ c) $y-y_1=m(x-x_1)$ d) None

5. Matrix $A_{m\times n}\ xB_{n\times p}$ is equal to _____.
   a) $AB_{m\times p}$ b) AB c) $AB_{n\times p}$ d) AB_{pn}

6. A matrix with equal number of rows & columns is called_____.
   a) Square matrix b) Rectangular matrix
   c) Index d) Row matrix

7. The terms lying between the first term & the last term of a Arithmetic Progression is called
   a) Arithmetic mean b) Progression
   c) Common difference d)Average

8. The ratio between any terms to the previous term of a GP is _____.
   a) Common difference b) Ratio
   c) Common ratio d) Term

9. The equation of the second degree is called _____.
   a) Cubic Equation b) Simultaneous equation
   c) Linear equation d) Quadratic equation

10. The equation with highest index for the variable as 2 is called _____.
   a) Quadratic equation b) Cubic Equation
   c) Simultaneous equation d) Linear equation.

SECTION – B

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

11. Evaluate $\left(5a^2\right)^3$.

12. Find the compound ratio for $3:2$ & $4:5$.

13. Calculate the distance between the points $(3,7)$ & $(4,8)$.

14. Find the slope of the line joining the two points $(-3,2)$ & $(6,7)$.

15. *If* $A=\begin{bmatrix}1 & 4 & 6\\ 2 & 3 & -2\end{bmatrix}$ & $B=\begin{bmatrix}2 & 2 & 3\\ 1 & 1 & 5\end{bmatrix}$, find $2A-3B$.

16. Find the 15th term in the series $2, 8, 14, 20, ...$

17. If the sum of the roots is 5 & their product is 2, find the equation.

SECTION – C

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

18. a) Evaluate : $\dfrac{15^{-1/5}\ 225^{4/5}\ 625^{-2/5}}{125^{3/5}}$.

(OR)

b) *If* $a:b=1:2,\ b:c=3:2$ & $c:d=5:4,$ find the ratio $a:b:c:d$.

19. a) If a line passes through $(2,-5)$ & $(4,6)$, find the equation for the line.

(OR)

b) Find the equation of a line with slope 5 and through the point $(4,9)$.

20. a) *If* $A=\begin{bmatrix}2 & 4 & -3\\ 2 & 0 & 5\end{bmatrix}$ & $B=\begin{bmatrix}2 & -4\\ 1 & 5\\ 7 & 9\end{bmatrix}$, find AB.

(OR)

b) Find the sum of the series $2+7+12+17+.....+152$.

SECTION – D

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

21. Simplify : $\left[\dfrac{\sqrt[4]{3^5}.\ 3^{-5/4}}{\sqrt[3]{81^2}\ \ 3^{2/3}}\right]^{-2/3} \div \left[\dfrac{\sqrt[3]{81}\ \sqrt[6]{9^5}}{\sqrt{3}\ \ 81^{-2}}\right]^3$.

22. If the line joining the points $(-2,5)$ *and* $(6,a)$ are perpendicular to the line joining the points $(2,-1)$ *and* $(8,3)$, find the value of a.

23. *If* $A=\begin{bmatrix}2 & 4 & 3\\ 1 & 2 & 0\\ 2 & 2 & 1\end{bmatrix}$, $B=\begin{bmatrix}1 & 1 & 5\\ -3 & -2 & 4\\ 0 & 4 & 6\end{bmatrix}$ & $C=\begin{bmatrix}1 & 3 & 9\\ 3 & -2 & 4\\ 1 & 7 & 2\end{bmatrix}$,

find $2A+3B-2C,\ A^2,\ B^2$ & C^2.

24. Solve : i) $2x+3y=23$ & $5x+2y=30$.

ii) $5x^2+14x+8=0$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. Write a negation statement for suresh and ramesh do not like fruits.
2. "7" is an even number this is a statement. (True / False)
3. Change to symbetic form ramar and mohan goto college.
4. $p \vee (p \wedge q) \Leftrightarrow$ _____.

   a) q b) p c) 7q d) 7p
5. P : I will buy a computer

   Q : I will a car write a statement $p \vee q$
6. $p \vee 1 \Leftrightarrow$ _____.

   a) 0 b) 1 c) $\sim p$ d) $\sim q$
7. $p \vee \sim p \Leftrightarrow$ _____.

   a) 0 b) 1 c) 7p d) none of these
8. $p \vee 1 \Leftrightarrow$ _____.

   a) 0 b) 1 c) p d) none of these
9. $p \to q \Leftrightarrow$ _____.

   a) $\sim p \vee q$ b) $p \wedge q$ c) 1 d) none of these
10. $\sim (p \vee q) \Leftrightarrow \sim p \wedge \sim q.$ (True / False)

SECTION – B

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

11. Write the truth table for conditional operator.

12. Write the truth table for biconditional operator.

13. Define a Tautology.

14. Write the distributive law.

15. Write the Demorgan's law.

16. Write the aborption law.

17. Write the Commulative law.

SECTION – C

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

18. a) i) Give truth table for $(p \wedge q) \wedge r$.

ii) Give truth table for $(p \wedge q) \vee (\sim q \wedge r)$.

(OR)

b) i) Give truth table for $(p \to q) \to (7p \vee q)$.

ii) Give truth table for $(p \vee q) \vee \sim p$.

19. a) i) Check for tautology $p \to (p \vee q)$.

ii) Check for tautology $q \vee (p \wedge 7q) \vee (7p \wedge 7q)$.

(OR)

b) Prove that $(p \to q) \Rightarrow (7q \to 7p)$.

20. a) Prove that $(p \to (q \to p)) \Leftrightarrow ((7p) \to (p \to q))$.

(OR)

b) i) Give truth table for $(p \vee q) \Leftrightarrow 7(7p \wedge 7q)$.

ii) Prove $(p \to q) \Leftrightarrow (7p \wedge q)$.

SECTION – D

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

21. Prove that i) $7(p \wedge q) \to (7p \vee (7p \vee q)) \Leftrightarrow (7p \vee q)$.

ii) $(p \vee q) \wedge (7p \wedge (7p \wedge q)) \Leftrightarrow (7p \wedge q)$.

22. Give truth table for $(p \vee q) \vee (r \vee s)$.

23. Draw a logical networks for

a) $(a+b).c$

b) $(a.\bar{b}) + (\bar{a}.b)$

c) $(a+b)(\bar{a}+\bar{b})$

24. Give truth table

a) $p \wedge \sim p$

b) $(p \wedge q) \wedge r$

c) $(7p) \vee (7q)$

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
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B.Sc. Mathematics Degree (Semester) Examinations, November 2018
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. A speed of 14 metres per second is the same as
   a) 28 kmph b) 46.6 kmph c) 50.4 kmph d) 70 kmph
4. A train 280 m long, running with a speed of 63 kmph will pass a tree in
   a) 15 sec b) 16 sec c) 18 sec d) 20 sec
5. If Principal P, Rate R% & time T years are given, then Simple Interest is
   a) $PRT/100$ b) $100 \times S.I/RT$ c) $100 \times S.I/PT$ d) $100 \times S.I/PR$
6. When the interest is compounded Half yearly, the amount is
   a) $P\left[1+R/100\right]^{n}$ b) $P\left[1+\left(R/2\right)/100\right]^{2n}$
   c) $P\left[1+\left(R/4\right)/100\right]^{4n}$ d) None
7. The value of $\log_7 1$ is
   a) 0 b) 1 c) –1 d) None

8. The value of $\log_{34} 34$ is

a) 0 b) 1 c) –1 d) None

9. The 100 years has _____ odd days.

a) 1 b) 2 c) 4 d) 5

10. The 4^{th} odd day lie on

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

SECTION – B

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

11. A and B together can complete the work in 4 days. If A alone can complete the same work in 12 days, in how many day B can alone complete that work?
12. A man travelled from the village to the post office at 25 kmph & return back by walk at 4 kmph. What is his average speed?
13. How long does a train 110 metres long running at the speed of 72 kmph take to cross a bridge 132 metres in length?
14. Suppose a train is running with a speed of 59 kmph, whereas it pass a man who is running at 7 kmph in the opposite direction. What is the relative speed of both?
15. At what rate percent per annum will a sum of money double in 16 years?
16. Find the compound interest on Rs. 7500 at 4 % per annum for 2 years, compounded annually?
17. Evaluate $\log_5 3 \times \log_{27} 25$.

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 aeroplane 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) Walking at 5/6 of its usual speed, a train is 10 minutes late. Find its usual time to cover the journey?

(OR)

b) Two trains 137 metres and 163 metres in length are running towards each other on parallel lines, one at 42 kmph & another at 48 kmph. In what time will they meet from the moment?

20. a) 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?

(OR)

b) Find the compound interest on Rs.10,000 in 2 years at 4 % per annum, the interest being compounded half yearly?

SECTION – D

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

21. 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 the length of the platform?
22. 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?
23. Simplify : $\log\frac{75}{16} - 2\log\frac{5}{9} + \log\frac{32}{243}$.
24. What was the day of the week on 15^{th} August, 1947?

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