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

**B.Sc. Physics** Degree (Semester) Examinations, April 2016
Part – III : Allied Subject : Second Semester : Paper – II

**MATHEMATICS – II**
Under CBCS – Credit 5

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

## SECTION – A

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

1. The general ordinary differential equation of $n^{th}$ order is of the form $f\left(x, y', y'', ....., y^{(n)}\right)$ is equal to _____.

   a) zero b) one c) two d) $n$

2. *If* $\left[\frac{1}{f(D)}\right] X = u$ *then* $\left[f(D)\right](u) = X$. Hence u is a _____ solution of $\left(D^n + a_1 D^{n-1} + ..... + a_n\right) y = X$.

   a) linear b) independent c) particular d) none

3. $L(1) =$ _____.

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

4. A partial differential equation, which involves only the first order partial derivatives $p$ *and* $q$ is called a _____ partial differential equation.

   a) second order b) first order c) $n^{th}$ order d) none

5. The function $f(x)$ is called an odd function *if* $f(-x) =$ _____.

   a) $f(x)$ b) $-f(x)$ c) $f(-x)$ d) none

6. A differential equation if the dependent variables and its derivatives appear only in the first degree is called _____ equation.

7. $\left[\frac{1}{f(D)}\right] e^{ax} =$ _____.

8. $L^{-1}\left[\frac{1}{s^2}\right] =$ _____.

9. A partial differential equation which is linear in $p$ *and* $q$ is of the form _____.

10. A real function $f(x)$ is called an _____ *if* $f(-x) = f(x)$ for all $x$.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Solve : $y' = \left(\frac{y}{x}\right) + \tan\left(\frac{y}{x}\right)$.

**(OR)**

b) Solve : $\frac{dy}{dx} - y\cot x = 2x\sin x$.

12. a) Solve : $\left(D^2 - 4\right) y = e^{2x} + e^{-4x}$.

**(OR)**

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

13. a) Find the Laplace transform of $t^2 + \cos 2t\cos t + \sin^2 2t$.

**(OR)**

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

14. a) Solve : $2p + 3q = 1$.

**(OR)**

b) Solve : $pq + p + q = 0$.

15. a) Determine the Fourier expansion of the function $f(x) = x$ where $-\pi \le x \le \pi$.

**(OR)**

b) Find the Fourier sine series for $f(x) = k$ *in* $0 < x < \pi$.

## SECTION – C

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

16. Solve : $\frac{dy}{dx} = \frac{y^3 + 3x^2 y}{x^3 + 2xy^2}$.

17. Solve : $\left(D^2 - 2D + 2\right) y = e^x \sin x$.

18. Find the inverse Laplace transform for

i) $\frac{1}{(s+3)^2 + 25}$ ii) $\frac{s}{(s+2)^2}$ iii) $\frac{s+1}{s^2 + 2s + 2}$

19. Form a partial differential equation by eliminating the arbitrary function $\varphi$ *from* $\varphi\left(x + y + z,\ x^2 + y^2 + z^2\right) = 0$.

20. Obtain a Cosine series for $f(x) = e^x$ *in* $0 < x < \pi$.

⁂⁂⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Allied Subject : Fourth 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. C++ is mainly used in
   a) Object Based Language b) Object Oriented Language
   c) Object Orientation Language
   d) Object Oriented and Based Language
2. The process of building new classes from existing one is called _____.
   a) Polymorphism b) Structure c) Inheritance d) Cascading
3. The operator that cannot be overloaded is
   a) ++ b) :: c) ( ) d) ~
4. Group of characters is called
   a) method b) member c) String d) object
5. The process of one derived classes to new class derived called
   a) Multiple Inheritance b) Inheritance
   c) Multilevel Inheritance d) Hybrid Inheritance
6. The function calls itself is called _____.
7. _____ is an Scope Resolution Operator.
8. Destructor is denoted by the symbol _____.
9. Function name should be same but parameter declaration is different is called _____.
10. The process of building new classes from existing one is called _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Write the benefits and applications oc C++. **(OR)**
    b) Write about the structure of C++ Program.
12. a) Define : Class and write the syntax and explain it. **(OR)**
    b) Explain about friend function in C++.
13. a) Explain about constructors with an example. **(OR)**
    b) Explain about inline functions in C++.
14. a) Explain about operator overloading in C++. **(OR)**
    b) Write the rules for operator overloading in C++.
15. a) Explain about Multilevel Inheritance. **(OR)**
    b) Explain about Virtual function in C++.

## SECTION – C

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

16. Discuss about OOPs Concept in detail.
17. Explain about arrays with example.
18. Define Constructors. Write its type and explain any two types.
19. Write a C++ program to add two complex numbers using binary operator overloading.
20. Explain about Inheritance and explain its types with neat diagram.

⁂⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Second Semester : Paper – I

**INTEGRAL CALCULUS**
Under CBCS – Credit 4

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

## SECTION – A

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

1. The value of $\int_0^{\pi} \frac{dx}{5+4\cos x}$ is

   a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\pi$ d) None

2. The value of $\int xe^x dx$ is

   a) $e^x(x-1)$ b) $xe^x$ c) $(x-1)$ d) None

3. The value of $\int_0^{\infty} e^{-x^2} dx$ is

   a) $\pi$ b) $\sqrt{\pi}$ c) $\frac{\sqrt{\pi}}{2}$ d) None

4. The volume of the tetrahedron bounded by the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ is

   a) $abc$ b) $\frac{abc}{3}$ c) $\frac{abc}{6}$ d) None

5. *If* $f(x)=x^2$ then the value of $a_0$ in $0$ *to* $\pi$ is

   a) $\frac{2\pi^2}{3}$ b) $\frac{\pi^2}{3}$ c) $\frac{2\pi}{3}$ d) None

6. $\int_a^b f(x)dx =$ _____.

7. *If* $f(x)$ is _____ function then $\int_{-a}^{a} f(x)\,dx$ is 0.

8. The value of $\Gamma\left(\frac{1}{2}\right)$ is _____.

9. The value of $\frac{\partial(u,v)}{\partial(x,y)}.\frac{\partial(x,y)}{\partial(u,v)}$ is _____.

10. *If* $f(x)$ is even function then the Fourier coefficients of ___ is zero.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Evaluate $\int \frac{2x+3}{x^2+x+1}\,dx$.

**(OR)**

b) Evaluate $\int \frac{dx}{(x+1)\sqrt{(x^2+x+1)}}$.

12. a) Find the reduction formula for $\int \cos^n x\,dx$ and also evaluate $\int_0^{\pi/2} \cos^n x\,dx$.

**(OR)**

b) Evaluate $\int_0^{\pi/2} \frac{\sin^4 x}{\sin^4 x+\cos^4 x}\,dx$.

13. a) Evaluate $\iint xydxdy$ taken over the positive quadrant of the circle $x^2+y^2=a^2$.

**(OR)**

b) Evaluate $\int_0^1 x^m \left(\log\left(\frac{1}{x}\right)\right)^n dx$.

14. a) Find the area of the cardioids $r=a(1+\cos\theta)$.

**(OR)**

b) Given that $x+y=u,\ y=uv,$ change the variables to $u,v$ in the integral $\iint\left[xy(1-x-y)\right]^{1/2} dxdy$ taken over the area of the triangle with sides $x=0,\ y=0.\ x+y=1$ and evaluate it.

15. a) Find the Fourier series for the function $f(x)=x$ in the period $-\pi \le x \le \pi$.

**(OR)**

b) Find the Half range Fourier cosine series for $f(x)=c$ *in* $(0,\pi)$.

## SECTION – C

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

16. Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)}\,dx$.

17. Prove that $\int_0^{\pi/4} \log(1+\tan\theta)\,d\theta = \frac{\pi}{8}\log 2$.

18. Obtain the relation between Beta and Gamma function.

19. Evaluate $\iiint xyz\,dx\,dy\,dz$ taken through the positive octant of the sphere $x^2+y^2+z^2=a^2$.

20. Find the Fourier series for $f(x)=e^x$ in the period 0 *to* $2\pi$.

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Second Semester : Paper – II

**ANALYTICAL GEOMETRY 3D AND VECTOR CALCULUS**
Under CBCS – Credit 4

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

## SECTION – A

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

1. If the equation of two planes differ only in the constant term, then they are _____.
   a) equal b) perpendicular c) parallel d) not equal
2. The coordinates of any point on this line can be expressed in terms of a single parameter _____.
   a) $x$ b) $y$ c) $z$ d) $r$
3. The centre of the sphere is at the origin and its radius is a, then the equation of the sphere is _____.
   a) $x+y=a$ b) $y+z=a$ c) $x+z=a$ d) $x^2+y^2+z^2=a^2$
4. *If* $\vec{a}$ is a constant vector, then $\nabla\left(\vec{a}.\vec{r}\right)=$_____ .
   a) $\vec{r}$ b) $\vec{a}$ c) $2\vec{a}$ d) 0
5. *If* $\vec{r}=x\vec{i}+y\vec{j}+z\vec{k}$ then *curl* $\vec{r}=$_____.
   a) 0 b) 1 c) 2 d) 3
6. Two straight lines in space need not _____.
7. The normal to the plane is perpendicular to the _____.
8. The fixed point is called the _____ of the sphere.
9. *If* $\vec{u}$ *and* $\vec{v}$ are vector point functions, then a scalar point function $\nabla.\left(\vec{u}+\vec{v}\right)=$ _____.
10. $\int\vec{F}.d\vec{r}$ is independent of the path of integration, then $\int\vec{F}.d\vec{r}$ along any closed path is _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Find the direction cosines of the line joining the points $(3,-5,4)$ *and* $(1,-8,-2)$.

**(OR)**

b) Find the equation to the plane through $(3,4,5)$ parallel to the plane $2x+3y-z=0$.

12. a) Find the point where the line $\frac{x-2}{2}=\frac{y-4}{-3}=\frac{z+6}{4}$ meets the plane $2x+4y-z-2=0$.

**(OR)**

b) Prove that the lines $\frac{x+1}{-3}=\frac{y+10}{8}=\frac{z-1}{2}$; $\frac{x+3}{-4}=\frac{y+1}{7}=\frac{z-4}{1}$ are coplanar.

13. a) Find the coordinates of the centre and radius of the sphere $2x^2+2y^2+2z^2-2x+4y+2z-15=0$.

**(OR)**

b) Show that the plane $2x-y-2z=16$ touches the sphere $x^2+y^2+z^2-4x+2y+2z-3=0$ and find the point of contact.

14. a) Find the directional derivative of $\varphi(X,Y,Z)=XY^2+YZ^2$ at the point $(2,-1,1)$ in the direction of the vector $\vec{i}+2\vec{j}+2\vec{k}$.

**(OR)**

b) Compute the divergence and curl of the vector $\vec{F}=XYZ\,\vec{i}+3X^2Y\,\vec{j}+\left(XZ^2-Y^2Z\right)\vec{k}$ *at* $(1,2,-1)$.

15. a) Show that $\iint \vec{r}.\,n\,ds=3V$, where $V$ is the volume enclosed by $S$ *and* $\vec{r}$ is the position vector.

**(OR)**

b) Evaluate $\iint\left(X^2\,dY\;dZ+X^2Y\,dZ\;dX+X^2Z\,dX\;dY\right)$ over the surface bounded by $Z=0;\;\; Z=C$ *and* $x^2+y^2=a^2$.

## SECTION – C

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

16. Find the equation of the plane passing through the points $(2,-5,-3)$, $(-2,-3,5)$ *and* $(5,3,-3)$.

17. Find the shortest distance between the lines $\frac{x-3}{-1}=\frac{y-4}{2}=\frac{z+2}{1}$; $\frac{x-1}{1}=\frac{y+7}{3}=\frac{z+2}{2}$.

18. Find the equation of the sphere having the circle $x^2+y^2+z^2-2x+4y-6z+7=0,\;\; 2x-y+2z=5$ for a great circle.

19. Prove that $\vec{V}=r^n\,\vec{r}$ is irrotational. Find n when it is also solenoidal.

20. Verify Stoke's Theorem when $\vec{F}=(2X-Y)\,\vec{i}-YZ^2\,\vec{j}-Y^2\vec{k}$, where $S$ is the upper hemisphere of the unit sphere $x^2+y^2+z^2=1$ *and* $C$ is its boundary.

⁂⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Fourth Semester : Paper – I

**SEQUENCE AND SERIES**
Under CBCS – Credit 5

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

## SECTION – A

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

1. *Let* $A=\{1,3,5,6\}$ then glb of $A=1$ and lub of $A=$ _____.
   a) 2 b) 3 c) 5 d) 6
2. The sequence $1,1,2,3,5,8,13,.....$ is called
   a) Geometric sequence b) Constant sequence
   c) Bounded sequence d) Fibonacci's sequence
3. A sequence $(a_n)$ in $\mathbb{R}$ is convergent $\Leftrightarrow$ it is a
   a) Constant sequence b) Oscillates
   c) Monotonic d) Cauchy sequence
4. A series of positive terms _____ oscillate.
   a) can b) cannot c) converges to d) diverges to
5. The series $\sum\frac{(-1)^n}{n}$ is _____.
   a) absolutely convergent b) not absolutely convergent
   c) divergent d) conditionally convergent
6. For any two real numbers $x$ *and* $y$ then $|x-y|$ is _____.
7. A sequence cannot converge to _____ different limits.
8. $\lim\limits_{n\to\infty} n^{1/n}=$_____.
9. The series $\sum\frac{1}{\sqrt{n^3+1}}$ is _____.
10. The series $\sum\frac{(-1)^n \sin n\alpha}{n^3}$ is _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) State and prove Triangle inequalities.
    **(OR)**
    b) Prove that $a^7+b^7+c^7>abc\left(a^4+b^4+c^4\right)$.
12. a) Prove that any Convergent sequence is a bounded sequence.
    **(OR)**
    b) Show that the sequence $\left(1+\frac{1}{n}\right)^n$ converges.
13. a) State and prove Cesaro's theorem.
    **(OR)**
    b) Prove that any Convergent sequence is a Cauchy sequence.
14. a) State and prove Cauchy's general principle of convergence.
    **(OR)**
    b) Prove that $\sum\frac{1}{4n^2-1}=\frac{1}{2}$.
15. a) State and prove Leibnitz's test.
    **(OR)**
    b) State and prove Abel's theorem.

## SECTION – C

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

16. *If* $x+y+z=1$ *and* $x,y,z$ are all positive then prove that $(1-x)(1-y)(1-z)>8xyz$.
17. Discuss the behaviour of the geometric sequence $(r^n)$.
18. State and prove Cauchy's first limit theorem.
19. State and prove Kummer's test.
20. State and prove Riemann's theorem.

⁂⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Fourth Semester : Paper – II

**DYNAMICS**
Under CBCS – Credit 4

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

## SECTION – A

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

1. The time of flight of a projectile is

   a) $\frac{u^2 \sin^2 \alpha}{2g}$ b) $\frac{u^2}{2g}$ c) $\frac{\sin^2 \alpha}{2g}$ d) $\frac{2u \sin \alpha}{g}$

2. If the sphere is perfectly elastic _____and the loss of kinetic energy is zero.

   a) $e = 1$ b) $e = 0$ c) $e = 2$ d) $e = 3$

3. A seconds pendulum is one whose period of oscillation is ___ seconds.

   a) 3 b) 2 c) 4 d) 1

4. _____is the polar equation of the equiangular spiral.

   a) $r = e^{\theta \cot \alpha}$ b) $r = ae^{\cot \alpha}$ c) $r = ae^{\theta \cot \alpha}$ d) $r = ae^{\theta}$

5. Moment of inertia of a rectangular lamina is _____.

   a) $\frac{4M\left(a^2 + b^2\right)}{3}$ b) $\frac{4M\left(a^2 + b^2\right)}{2}$ c) $\frac{M\left(a^2 + b^2\right)}{3}$ d) $\frac{4\left(a^2 + b^2\right)}{3}$

6. The maximum range is _____.
7. If two equal perfectly elastic spheres impinge, they interchange their velocities in the direction of the _____.
8. The periodic time of a S.H.M. is _____.
9. Velocities at any point on the central orbit under the _____ law.
10. The _____ formula is used in moment of inertia.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Find the greatest distance of the projectile from the inclined plane and show that is attained in half the total time of flight.

**(OR)**

b) Find the maximum range on a plane through the point of projection inclined at an angle $\beta$ to the horizon.

12. a) A ball of mass $8gm.$ moving with a velocity of $10cm.\ per$ sec. impinges directly on another of mass $24gm.$ moving at $2cm.\ per$ sec. in the same direction. *If* $e = \frac{1}{2}$, find the velocities after impact. Also calculate the loss in kinetic energy.

**(OR)**

b) Explain the direct impact of two smooth spheres.

13. a) Find the general solution of the S.H.M. equation.

**(OR)**

b) Find the composition of two S.H.Ms. of the same period in two perpendicular directions.

14. a) Obtain the pedal equation of the central orbit.

**(OR)**

b) Prove that in every central orbit the areal velocity is constant.

15. a) Find the moment of inertia of a thin uniform rod.

**(OR)**

b) State and prove the perpendicular axis theorem.

## SECTION – C

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

16. Prove that the path of a projectile is a parabola.

17. Derive the loss of kinetic energy due to oblique impact of two smooth spheres.

18. If the displacement of a moving point at any time be given by an equation of the form $x = a\cos\omega t + b\sin\omega t$, show that the motion is a simple harmonic motion. *If* $a = 3,\ b = 4,\ \omega = 2$ determine the period, amplitude, maximum velocity and maximum acceleration of the motion.

19. Obtain the differential equation of a central orbit in polar coordinates.

20. State and prove the parallel axis theorem.

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Sixth Semester : Paper – I

**LINEAR ALGEBRA**
Under CBCS – Credit 5

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

## SECTION – A

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

1. A linear transformation $T:V\to W$ is a monomorphism iff Ker $T$ is _____.
2. In an inner product space, $x$ is orthogonal to $y$ *if* _____.
3. A real square matrix $A$ is orthogonal if _____.
4. Cayley Hamilton theorem states that "Any square matrix satisfies its _____".
5. *If* $q(x_1,x_2)=2x_1^2+x_1x_2+x_2^2$ is the quadratic form defined on $V_2(R)$ then the symmetric matrix associated with $q$ is _____.
6. The dimension of C over R is
   a) 1 b) $i$ c) 2 d) 0
7. The orthogonal complement of an inner product space $V$ is
   a) $\{0\}$ b) $\{1\}$ c) $\{0,1\}$ d) $V$
8. The rank of the matrix $A=\begin{pmatrix}1 & 1\\ 1 & 1\end{pmatrix}$ is
   a) 0 b) 1 c) 2 d) 4
9. The characteristic roots of a Hermitian matrix are
   a) real b) purely imaginary c) 0 or purely imaginary d) none
10. *Let* $f$ be the bilinear form defined on $V_2(R)$ by $f(x,y)=x_1y_1+x_2y_2$, where $x=(x_1,x_2)$ *and* $y=(y_1,y_2)$. Then matrix of $f$ is
    a) $\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$ b) $\begin{pmatrix}2 & 3\\ 4 & 5\end{pmatrix}$ c) $\begin{pmatrix}2 & 3\\ 3 & 0\end{pmatrix}$ d) $\begin{pmatrix}2 & 3\\ 3 & 5\end{pmatrix}$

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) *Let* $A$ *and* $B$ be subspaces of a vector space $V$ over a field $F$.

Prove that $\frac{A+B}{A} \cong \frac{B}{A \cap B}$. **(OR)**

b) *Let* $A$ *and* $B$ be subspaces of a vector space $V$. Prove that

i) $A \cap B$ is a subspace of $V$.

ii) $A+B$ is the smallest subspace containing $A$ *and* $B$.

12. a) Apply Gram-Schmidt process to construct an orthonormal basis for $V_3(R)$ with standard inner product for the basis $\{v_1, v_2, v_3\}$ where $v_1 = (1,0,1);\ v_2 = (1,3,1)$ *and* $v_3 = (3,2,1)$. **(OR)**

b) *Let* $W_1$ *and* $W_2$ be subspaces of a finite dimensional inner product space. Show that i) $(W_1 + W_2)^{\perp} = W_1^{\perp} \cap W_2^{\perp}$

ii) $(W_1 \cap W_2)^{\perp} = W_1^{\perp} + W_2^{\perp}$

13. a) Find the inverse of the matrix $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & -1 \\ -2 & 1 & 3 \end{pmatrix}$ using adjoint of matrix $A$. **(OR)**

b) Find the rank of the matrix $A = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 4 & 2 \end{pmatrix}$ using elementary operations.

14. a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 3 & 3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{pmatrix}$

**(OR)**

b) Find the characteristic roots and the characteristic vectors of the matrix $A = \begin{pmatrix} 8 & 2 & -2 \\ 3 & 3 & -1 \\ 24 & 8 & -6 \end{pmatrix}$

15. a) Reduce the quadratic form $2x_1x_2 - x_1x_3 + x_1x_4 - x_2x_3 + x_2x_4 - 2x_3x_4$ to the diagonal form using Lagrange's method.

**(OR)**

b) Prove that a bilinear form $f$ defined on $V$ is symmetric iff its matrix $(a_{ij})$ w.r.t. any one basis $\{v_1, v_2, ..., v_n\}$ is symmetric.

## SECTION – C

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

16. *Let* $V$ be a finite dimensional vector space over a field F and let W be a subspace of V. Prove that i) $\dim W \le \dim V$

ii) $\dim\left(\frac{V}{W}\right) = \dim V - \dim W$

17. *Let* $V$ be an inner product space and norm defined in $V$.

Show that i) $\|x\| \ge 0$ *and* $\|x\| = 0$ *iff* $x = 0$ ii) $\|\alpha x\| = |\alpha|\ \|x\|$

iii) $|\langle x, y \rangle| \le \|x\|\ \|y\|$ iv) $\|x + y\| \le \|x\| + \|y\|$

18. *Let* $A$ *and* $B$ be square matrices of order n. Prove the following

i) $A$ *and* $B$ are symmetric $\Rightarrow AB + BA$ is symmetric

ii) $A$ *and* $B$ are skew symmetric $\Rightarrow A + B$ is skew symmetric

iii) $A$ *and* $B$ are Hermitian $\Rightarrow A + B$ is Hermitian and $AB - BA$ is skew Hermitian

iv) $A$ *and* $B$ are orthogonal $\Rightarrow AB$ is orthogonal

19. Verify whether the following system of equations is consistent. If it is consistent, find the solution. $x - 4y - 3z = -16;\ 4x - y + 6z = 16;$ $2x + 7y + 12z = 48;\ 5x - 5y + 3z = 0;$

20. Obtain the matrices for the linear transformation $T : V_3(R) \to V_3(R)$ given by $T(a,b,c) = (3a + c, -2a + b, a + 2b + 4c)$ w.r.t.

i) the standard basis

ii) the basis $\{(1,0,1), (-1,2,1), (2,1,1)\}$ for both domain and range.

⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Core Subject : Sixth Semester : Paper – II

**OPERATIONS RESEARCH**
Under CBCS – Credit 5

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

## SECTION – A

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

1. Minimum inventory equals
   a) EOQ b) Reorder level c) safety stock d) None
2. $M/M_1$ model is known as
   a) Poisson Model b) Birth Death Model
   c) Exponential Model d) Multiserver Model
3. _____ of an activity is defined as the difference between the latest finish and the earliest finish of the activity.
   a) total float b) free float c) independent float d) None
4. A sequencing problem involving six jobs and three machines requires a evaluation of
   a) $(6!+6!+6!)$ sequences b) $(6!)^3$ sequences
   c) $(6\times6\times6)$ sequences d) $(6+6+6)$ sequences
5. Equipment should be replaced when maintenance cost equals the _____.
   a) capital cost b) annual cost
   c) average annual total cost d) total cost
6. Reduction in procurement cost _____ EOQ.
7. In kendall's notation a/b/c:d/e 'b' refers to _____.
8. PERT is the _____ oriented technique.
9. The algorithm used to find the optimal sequence of n jobs through 2 *or* 3 machines is due to _____.
10. The depreciation value $V$ is _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Describe the following terms related to the inventory problems.

i) Set-up cost ii) Shortage cost

iii) Re-order level iv) Economic order quantity

**(OR)**

b) A certain item costs Rs. 235 per ton. The monthly requirements are 5 tons, and each time the stock is replenishment, there is a setup cost of Rs. 1000. The cost of carrying inventory has been estimated at 10% of the average inventory per year. What is the optimum order quantity.

12. a) Explain the operational characteristics of a queueing system.

**(OR)**

b) A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

13. a) Write the rules for constructing network.

**(OR)**

b) Draw the network for the following data and find the critical path.

| Activity | 1-2 | 1-3 | 1-5 | 2-3 | 2-4 | 3-4 | 3-5 | 3-6 | 4-6 | 5-6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Duration(weeks) | 8 | 7 | 12 | 4 | 10 | 3 | 5 | 10 | 7 | 4 |



14. a) What are the assumptions underlying a sequencing problem.

**(OR)**

b) In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing timings (in hours) for the jobs are given here. Determine the sequence for performing the jobs that would minimize the total elapsed time T.

| Job | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Machine A | 5 | 9 | 4 | 7 | 8 | 6 |
| Machine B | 7 | 4 | 8 | 3 | 9 | 5 |

15. a) The capital cost of a machine is Rs. 80,000. The expected maintenance costs and resale price in different years are as given under.

| | | | | | |
|---|---|---|---|---|---|
| Year | : | 1 | 2 | 3 | 4 |
| Maintenance Cost | : | 1000 | 1200 | 1600 | 2400 |
| Resale value | : | 75000 | 72000 | 70000 | 65000 |

After what time interval should be machine be replaced.

**(OR)**

b) Explain the two types of replacement policy and also write the replacement situation may be placed into four categories.

## SECTION – C

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

16. Derive the optimum lot size, optimum time interval and optimum average cost for the manufacturing model with no shortages.

17. Derive the Poisson probability law with mean $\lambda t$ in pure birth process.

18. The following table shows the jobs of a network along with their time (in days) estimates

| Jobs: | 1–2 | 1–6 | 2–3 | 2–4 | 3–5 | 4–5 | 6–7 | 5–8 | 7–8 |
|---|---|---|---|---|---|---|---|---|---|
| Optimistic Time: | 1 | 2 | 2 | 2 | 7 | 5 | 5 | 3 | 8 |
| Most likely Time: | 7 | 5 | 14 | 5 | 10 | 5 | 8 | 3 | 17 |
| Pessimistic Time: | 13 | 11 | 26 | 8 | 19 | 17 | 29 | 9 | 32 |

Draw the project network and find the probability that the project is completed in 40 days.

19. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines is given in hours and passing is not allowed.

| Job | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Machine A | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| Machine B | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| Machine C | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

20. Let the value of money be assumed to be 10% per year and suppose that the machine A is replaced after every 3 years whereas machine B is replaced after every 6 years. The yearly costs of both the machines are given below.

| Year : | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Machine : | 1000 | 200 | 400 | 1000 | 200 | 400 |
| Machine : | 1700 | 100 | 200 | 300 | 400 | 500 |

⁂⁂⁂⁂⁂⁂

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

**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Elective Subject : Sixth Semester : Paper – I

**GRAPH THEORY**
Under CBCS – Credit 5

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

## SECTION – A

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

1. A regular graph of degree 3 is called a _____.
   a) Complete graph b) Bi graph c) Multi graph d) Cubic graph
2. A closed walk of _____ length contains a cycle.
   a) Odd b) Even c) Both a and b d) None of these
3. The graph $K_3$ is _____.
   a) Eulerian b) Hamiltonian
   c) Eulerian and Hamiltonian d) Not eulerian not Hamiltonian
4. The graph $K_5$ is _____.
   a) Planar b) Perfect matching
   c) not planar d) no perfect matching
5. The constant $f(G,d) =$ _____.
   a) 0 b) 1 c) 2 d) $d(d-1)^{n-1}$
6. Every cubic graph has an _____ number of points.
7. A graph which is not connected is said to be _____.
8. The Petersen graph is _____.
9. The graphs $K_5$ *and* $K_{3,3}$ are _____.
10. The chromatic number of $K_P$ is _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Prove that $\delta \le \frac{2q}{p} \le \Delta$.

**(OR)**

b) Prove that $r(m,n) = r(n,m)$.

12. a) Prove that a graph G with p points and $\delta \ge \frac{p-1}{2}$ is connected.

**(OR)**

b) If G is a K – Connected graph. Prove that $q \ge \frac{pK}{2}$.

13. a) If G is a graph in which the degree of every vertex is atleast two then prove that G contains a cycle.

**(OR)**

b) Prove that every connected graph has a spanning tree.

14. a) State and prove Hall's marriage theorem.

**(OR)**

b) State and prove Euler's polyhedron formula.

15. a) If G is a uniquely n colourable. Prove that $\delta(G) \ge (n-1)$.

**(OR)**

b) Prove that $f(K_n, d) = d(d-1).....(d-n+1)$.

## SECTION – C

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

16. Prove that the maximum number of lines among all p point graphs with no triangles is $\left[\frac{p^2}{4}\right]$.

17. Prove that a graph G with atleast two points is bipartite iff all its cycles are of even length.

18. Show that the Petersen graph is non Hamiltonian.

19. Prove that every planar graph G with atleast 3 points is a subgraph of a tri angulated graph with the same number of points.

20. State and prove the five colour theorem.

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – III : Elective Subject : Sixth Semester : Paper – II

**COMPLEX ANALYSIS**
Under CBCS – Credit 5

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

## SECTION – A

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

1. Any bilinear transformation preserves
   a) Cross ratio b) Fixed point c) Analytic d) Harmonic
2. $C-R$ equations can be put in the complex form as
   a) $f_x = i\ f_y$ b) $f_x = -i\ f_y$ c) $f_y = -i\ f_x$ d) $f_y = i\ f_x$
3. $\int_C p\,dx + q\,dy$ depends only on the end points $C \Leftrightarrow$ of the integrand is
   a) closed b) open c) exact d) continuous
4. *Let* $f(z) = e^{1/z}$ be an essential singularity at
   a) $z = 1$ b) $z = 2$ c) $z = 3$ d) $z = 0$
5. The residue of $\cot z$ *at* $z = 0$ is
   a) 1 b) 2 c) 3 d) – 1
6. The transformation $\omega = \bar{z}$ is _____ a BLT.
7. *If u and v* are conjugate Harmonic functions then the product *uv* is _____.
8. *Let* $I = \int_C \frac{e^z}{z} dz$, $C$ is the unit circle $|z| = 1$, *then* $I =$ _____.
9. Use Taylor's series, expand $f(z) = \frac{z-1}{z+1}$ is _____.
10. Use Cauchy's Residue theorem, $\frac{1}{2\pi l} \int_C \frac{f^1(z)}{f(z)} dz =$ _____.

## SECTION – B

**Answer ALL Questions :** **(5 × 7 = 35)**

11. a) Prove that the transformation $\omega = \dfrac{5-4z}{4z-2}$ maps the unit circle $|z| = 1$ into a circle of radius unity and centre $-\dfrac{1}{2}$.

**(OR)**

b) Find the fixed point of the transformation $\omega = \dfrac{1+z}{1-z}$.

12. a) Prove that the functions $f(z)$ *and* $f(\overline{z})$ are simultaneously analytic.

**(OR)**

b) *If* $u+v = \dfrac{\sin 2x}{\cosh 2y - \cos 2x}$, Find the analytic function $f(z)$.

13. a) State and prove Cauchy's integral formula.

**(OR)**

b) State and prove Liouville's theorem.

14. a) Find the Laurent's series for $\dfrac{z}{(z+1)(z+2)}$ about $z = -2$.

**(OR)**

b) State and prove Weierstrass theorem for essential singularity.

15. a) State and prove Rouche's theorem.

**(OR)**

b) Evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{5+4\sin\theta}$.

## SECTION – C

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

16. Determine the BLT which maps $0, 1, \infty$ into $i, -1, -i$ respectively under this transformation. Show that the interior of the unit circle of the $z-$ plane maps onto the half plane left to the $v$ axis.

17. Prove that the function $f(z) = \begin{cases} \dfrac{x^3(1+i) - y^3(1-i)}{x^2+y^2} & if \quad z \neq 0 \\ 0 & if \quad z = 0 \end{cases}$

statistics $C-R$ equations at the origin but $f'(0)$ does not exist.

18. State and prove Cauchy's theorem.

19. State and prove Taylor's theorem.

20. State and prove Cauchy's residue theorem.

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**VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST**
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**B.A. / B.Sc.** Degree (Semester) Examinations, April 2016
Part – IV : Non-Major Elective Subject : Second Semester : Paper – I

**STATISTICS AND OPERATIONS RESEARCH**
Under CBCS – Credit 2

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

## SECTION – A

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

1. The arithmetic mean of 12,14,16 is _____.
   a) 12 b) 14 c) 16 d) None of these
2. The median for the set of numbers $6,8,2,5,9,5,6,5,2,3$ is _____.
   a) 5 b) 5.5 c) 6 d) None of these
3. The mode for the set of numbers $6,8,2,5,9,5,6,5,2,3$ is _____.
   a) 5 b) 5.5 c) 6 d) None of these
4. The range of the marks $20,22,27,30,40,48,45,32,31,35$ of 10 students is _____.
   a) 27 b) 28 c) 30 d) 40
5. The variance of the first 4 natural numbers that is $1,2,3,4$ is _____.
   a) 1 b) 1.25 c) 1.50 d) None of these
6. Linear programming problem involving 2 decision variables can easily be solved by graphical method. **(True / False)**
7. The Assignment problem is a special case of Transportation problem. **(True / False)**
8. The square of standard deviation is called _____.
9. Vogel's Approximation Method determines Initial Basic Feasible Solution which is very close to the optimal solution. **(True / False)**
10. Optimum feasible solution for a Linear Programming problem is obtained at one of the corner points. **(True / False)**

## SECTION – B

**Answer ALL Questions :** **(4 × 10 = 40)**

11. a) The red blood cell count in millions per cubic mm of 10 individuals were $4.27, 4.80, 4.99, 5.20, 4.32, 4.80, 5.00, 5.20, 5.26, 5.62$. Find its arithmetic mean.

**(OR)**

b) Find the median of the frequency distribution.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $f$ | 5 | 9 | 18 | 12 | 9 | 7 |

12. a) Find the mode of the following frequency distribution.

| Shoe Size | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| Number of persons | 10 | 28 | 38 | 42 | 45 | 15 | 8 | 7 |

**(OR)**

b) The weights in Kilograms of 5 students are $52, 82, 66, 58, 65$. Find the standard deviation of the weights.

13. a) A farm is engaged in breeding pigs. The pigs are fed on various products grown in the farm. In view of the need to ensure certain nutrient constituents (call them $X, Y$ *and* $Z$), it is necessary to buy two additional products, say, $A$ *and* $B$. One unit of product $A$ contains 36 units of $X$, 3 units of $Y$ *and* 20 units of $Z$.

One unit of product $B$ contains 6 units of $X$, 12 units of $Y$ *and* 10 units of $Z$. The minimum requirements of $X, Y$ *and* $Z$ is 108 units, 36 units and 100 units repectively. Product $A$ costs Rs.20 per unit and product $B$ Rs.40 per unit. Formulate the above as a linear programming problem to minimize the total cost.



**(OR)**

b) Obtain an initial Basic Feasible Solution to the following Transportation problem using 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 | |

14. a) Find the median for the following grouped frequency distribution.

| Class | 00-05 | 05-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 3 | 8 | 10 | 10 | 9 | 7 | 21 | 15 | 11 | 6 |

**(OR)**

b) Find the mode for the following grouped frequency distribution.

| Marks | 0 – 9 | 10 – 19 | 20 – 29 | 30 – 39 | 40 – 49 | 50 – 59 | 60 – 69 | 70 – 79 | 80 – 89 | 90 – 99 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of students | 6 | 29 | 87 | 181 | 247 | 263 | 133 | 43 | 9 | 2 |

## SECTION – C

**Answer any TWO Questions :** **(2 × 12½ = 25)**

15. Find the arithmetic mean and standard deviation of the monthly rent from the data given :

| Monthly rent | 60–80 | 80–100 | 100–120 | 120–140 | 140–160 |
|---|---|---|---|---|---|
| No. of terents | 18 | 21 | 45 | 95 | 88 |

16. Use Vogel's Approximation Method to obtain an IBFS (Initial Basic Feasible Solution) to the following 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 |
| Requirement | 200 | 225 | 275 | 250 | |

17. A company makes two kinds of leather belts. The respective profits of Belt A and Belt B are Rs.4 and Rs.3 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 belts 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 buckles per day are available. There are only 700 buckles a day available for belt B. Determine the optimal product mix graphically.

⁂⁂⁂⁂⁂⁂⁂

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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – IV : Skill Based Subject : Fourth Semester : Paper – I

**COMPETITIVE MATHEMATICS**
Under CBCS – Credit 2

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

## SECTION – A

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

1. Find the highest common factor of 36 and 84
   a) 4 b) 6 c) 12 d) 18
2. The H.C.F. of two numbers is 11 and their L.C.M. is 693. If one of the numbers is 77, find the other number
   a) 11 b) 693 c) 99 d) none
3. Which of the following fractions is greater than $3/4$ and less than $5/6$?
   a) $1/2$ b) $2/3$ c) $4/5$ d) $9/10$
4. Find $x$ *if* $\sqrt{\frac{32.4}{x}} = 2$
   a) 8.1 b) 2 c) 4 d) none
5. Find the average of all the numbers between 6 and 34 which are divisible by 5
   a) 18 b) 20 c) 24 d) 30
6. Sachin is younger than Rahul by 4 years If their ages are in the respective ratio of 7 : 9, how old is Sachin?
   a) 16 years b) 14 years c) 12 years d) none
7. The ratio 5 : 4 expressed as a percentage
   a) 12.5% b) 40% c) 80% d) 125%
8. What percentage of 7.5 kg is 18 gms?
   a) 0.025% b) 0.25% c) 2.5% d) 25%
9. Write the formula for gain %.
10. Find the fourth proportional to 4, 9, 12.

## SECTION – B

**Answer ALL Questions :** **(4 × 10 = 40)**

11. a) Find the H.C.F. of 513, 1134 and 1215.

**(OR)**

b) i) Find the value of $\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+\sqrt{225}}}}}$.

ii) Find the value of $\sqrt{3}$ upto 3 places of decimals.

12. a) i) If the mean of $a,b,c$ is $M$ *and* $ab+bc+ca=0$ then find the mean of $a^2,b^2,c^2$.

ii) Find the average of all odd numbers up to 100.

**(OR)**

b) i) The product of the ages of Ankit and Nikita is 240. If twice the age of Nikita is more than Ankits age by 4 years. What is Nikitas age?

ii) Find i) 2 is what percentage of 50?

ii) $\frac{1}{2}$ is what percentage of $\frac{1}{3}$?

13. a) i) Find the S.P. when

i) C.P. = Rs.56.25, gain % = 20

ii) C.P. = Rs.80.40, loss % = 5%

ii) If the cost price is 96% of the selling price, then what is the profit percent?

**(OR)**

b) i) Divide Rs.1162 among A, B, C in the ratio 35 : 28 : 20.

ii) *If* $x:y=3:4$ find $(4x+5y):(5x-2y)$.

14. a) i) Find the largest number of four digits exactly divisible by 12,15,18 *and* 27.

ii) Arrange fractions in decending order $\frac{3}{5},\frac{4}{7},\frac{8}{9}$ *and* $\frac{9}{11}$.

**(OR)**

b) i) *If* $a:b=5:9$ *and* $b:c=4:7$ find $a:b:c$.

ii) An inspector rejects 0.08% of the meters as defective. Howmany will be examine to reject 2?

## SECTION – C

**Answer any TWO Questions :** **(2 × 12½ = 25)**

15. a) An article is sold at a certain price. By selling it $\frac{2}{3}$ of that price one loses 10%. Find the gain % at original price.

b) A person incurs 5% loss by selling a watch for Rs.1140. All what price should the watch be sold to earn 5% profit?

16. a) Find the square root of 1471369.

b) Find the L.C.M. of 16, 24, 36 and 54.

17. a) Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years.

b) *If* $x:y=2:1$ then find $(x^2-y^2):(x^2+y^2)$.

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**VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST**
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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – IV : Skill Based Subject : Sixth Semester : Paper – I

**APPLIED STATISTICS**
Under CBCS – Credit 2

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

## SECTION – A

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

1. The qualitative characterstics of a population are called _____.
   a) frequencies b) attributes c) positive class d) none
2. Class frequencies of the type $(A),(B),(ABC)$..... are known as _____ class frequencies.
   a) positive b) negative c) contrary d) none
3. Given $n$ attributes total number of negative class frequencies is ____.
   a) $3^n$ b) $2^n$ c) $2^n-1$ d) none
4. Given $n$ attributes, total number of class frequencies is _____.
   a) $2^n$ b) $3^n$ c) $2^n-1$ d) none
5. A set of class frequencies is said to be _____ if none of them negative.
6. *If* $(AB)\neq\frac{(A)(B)}{N}$ we say that $A$ *and* $B$ are _____.
7. $A$ *and* $B$ are positive associated *if* $\delta>0$. **(True / False)**
8. *If* $A$ *and* $B$ are perfectly associated then $(AB)=(A)$. **(True / False)**
9. Yule's coefficient $Q$ and the coefficient of colligation $y$ is related by the relation.
   a) $Q=\frac{1+y^2}{2y}$ b) $Q=\frac{2y}{1+y^2}$ c) $Q=\frac{y}{1-y^2}$ d) none
10. Write the formula for Yule's coefficient of association.

## SECTION – B

**Answer ALL Questions :** **(4 × 10 = 40)**

11. a) i) Given that $(A)=(\alpha)=(B)=(\beta)=\frac{N}{2}$.

Show that i) $(AB)=(\alpha\beta)$ ii) $(A\beta)=(\alpha B)$

ii) Examine the consistency of data : $(A)=800,\ (B)=700,$

$(AB)=660\quad N=1000.$

**(OR)**

b) Given $(A)=30;\ (B)=25;\ (\alpha)=30;\ (\alpha\beta)=20$

Find i) $N$ ii) $(\beta)$ iii) $(AB)$ iv) $(A\beta)$ v) $(\alpha B)$

12. a) Find the limit of $(BC)$ for the following available dates $N=125,$

$(A)=48,\ (B)=62,\ (C)=45;\quad (A\beta)=7$ *and* $(A\gamma)=18.$

**(OR)**

b) In a class test in which 135 candidates were examined for proficiency in Physics and Chemistry, it was discovered that 75 students failed is Physics 90 failed in chemistry and 50 failed in both. Find the magnitude of association and state of there is any association between failing in Physics and Chemistry using Yule's coefficient of association $Q$.

13. a) Show whethere $A$ *and* $B$ are independent or positively associated or negatively associated in the following cases.

i) $(AB)=327,\ (A\beta)=545,\ (\alpha B)=741,\ (\alpha\beta)=235$



ii) $(A)=470,\ (AB)=300,\ (\alpha)=530,\ (\alpha B)=150$

**(OR)**

b) i) Given $(AB)=975,\ (\alpha B)=100,\ (A\beta)=25\ \ (\alpha\beta)=950.$

Find the remaining days frequencies.

ii) Show that there is some error in the following data : 50% of people are wealthy and healthy, 35% are wealthy not healthy, 20% are healthy but not wealthy.

14. a) From the following data compare the association between marks in physics and chemistry in M.K.U. and M.S.U.

| University | MSU | MKU |
|---|---|---|
| Total number of candidates | 200 | 1600 |
| Pass in Physics | 80 | 320 |
| Pass in Chemistry | 40 | 90 |
| Pass in Physics and Chemistry | 20 | 30 |

**(OR)**

b) Given the following positive class frequencies find the remaining class frequencies $N=20,\ (A)=9,\ (B)=12,\ (C)=8,$

$(AB)=6\quad (BC)=4,\quad (CA)=4,\quad (ABC)=3.$

## SECTION – C

**Answer any TWO Questions :** **(2 × 12½ = 25)**

15. The following statistics. Showing the lives in hours of four batches of electronic bulbs sold in different shops. Perform an analysis of variance and state your conclusion.

| Batches | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ |
|---|---|---|---|---|---|---|---|---|
| A | 1600 | 1610 | 1650 | 1680 | 1700 | 1720 | 1800 | --- |
| B | 1580 | 1640 | 1640 | 1700 | 1750 | --- | --- | --- |
| C | 1460 | 1550 | 1600 | 1620 | 1640 | 1660 | 1740 | 1820 |
| D | 1510 | 1520 | 1530 | 1570 | 1600 | 1680 | --- | --- |

16. A Company manufacturing a certain product appointed 4 sales man $S_1, S_2, S_3, S_4$ on three different areas $A, B$ *and* $C$. The quantity of the product is given below. Carry out the analysis of variance to test whether there is significant difference in the sales of 4 salesmen in the sales carried out in different areas.

| | $S_1$ | $S_2$ | $S_3$ | $S_4$ |
|---|---|---|---|---|
| A | 22 | 27 | 38 | 45 |
| B | 28 | 32 | 40 | 38 |
| C | 25 | 40 | 36 | 22 |

17. Analyse the variance in the following Latin square.

| | | |
|---|---|---|
| A8 | C18 | B9 |
| C9 | B18 | A16 |
| B11 | A10 | C20 |

⁂⁂⁂⁂⁂⁂⁂

**VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST**
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**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – IV : Skill Based Subject : Sixth Semester : Paper – II

**BOOLEAN ALGEBRA**
Under CBCS – Credit 2

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

## SECTION – A

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

1. In set of real numbers R we define $a \ \rho \ b$ iff $a^3 = b$. Is $\rho$

   a) Reflexive b) Symmetric c) Transitive d) None of these

2. Consider the relation $\rho$ defined on the set of integers $Z$ by $x \ \rho \ y$ iff $x - y$ is a multiple of 3. Then the equivalence class of $[2]$ is given by the set

   a) $\{3k+1 / k \in z\}$ b) $\{3k+0 / k \in z\}$ c) $\{3k+2 / k \in z\Delta\}$ d) None of these

3. Let $S = \{1,2,3,4,5\}$. Then a partition of $S$ is

   a) $\{\{1\},\{1,2\}\{3,4\},\{5\}\}$ b) $\{\{1\},\{2\},\{3,4\},\{5\}\}$

   c) $\{\{1,2\},\{3,4\},\{1,5\}\}$ d) None of these

4. Let $S = \{1,2,3\}$. Consider the equivalence relations

   $\rho = \{(1,1),(2,2),(3,3),(1,2),(2,1)\}$ *and*

   $\sigma = \{(1,1),(2,2),(3,3),(2,3),(3,2)\}$. Then $\rho \cup \sigma$ is

   a) not reflexive b) not symmetric c) not transitive d) none of these

5. Let $|A| = n$. Then the number of relations that can be defined on $A$ is _____.

6. Define a partially ordered set with an example.

7. Write the least element and the greatest element, if they exist, for the poset $(\{2,5,8,20,40\},\leq)$, $a \leq b$ iff $a$ *divides* $b$.

8. $S$ is any set. The poset $(\rho(S),\subseteq)$ is a lattice. Set $A,B \in \rho(S)$. Then $A \vee B =$ _____.

9. $M_5$ is

   a) Not a lattice  b) Not a modular lattice
   c) Not adistributive lattice  d) None of these

10. $N_5$ is

   a) Not a lattice  b) is a distributive lattice
   c) Not a modular lattice  d) None of these

## SECTION – B

**Answer ALL Questions :** **(4 × 10 = 40)**

11. a) In $N$ we define $a$ relation $\leq$ as follows : $a \leq b$ iff $a$ *divides* $b$. Show that '$\leq$' is reflexive, antisymmetric & transitive in $N$.

**(OR)**

b) Give an example of a relation which is
   i) reflexive, symmetric and transitive
   ii) reflexive, not symmetric and transitive
   iii) reflexive and symmetric but not transitive
   iv) symmetric and transitive but not reflexive

12. a) Draw the diagram for the following posets :
   i) $(p(\{1,2,3\},\subseteq))$
   ii) The set of all subgraoups of $V_4$, the Klein's 4–group under '$\subseteq$'
   iii) $D_{30}$, the set of all divisors of 30 under '/'.

**(OR)**

b) Show that in any lattice $L_5 : a \vee (b \wedge c) = (a \vee b) \wedge (a \wedge c)$ *and* $L_5' : a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$ are equivalent.

13. a) Define a modular lattice with an example. Is any distributive lattice a modular lattice?

**(OR)**

b) Show that in any distributive lattice $L$, $x \vee a = y \vee a$ *and* $x \wedge a = y \wedge a \Rightarrow x = y$.

14. a) Set $B$ be a Boolean algebra. Then prove that $(a \vee b)' = a' \wedge b'$ and $(a \wedge b)' = a' \vee b'$.

**(OR)**

b) Show that the lattice of normal subgroups of any group is a modular lattice.

## SECTION – C

**Answer any TWO Questions :** **(2 × 12½ = 25)**

15. Show that every equivalent relation defined in a set $S$ gives rise to a partition of $S$ and conversely.

16. In any lattice $(L,\vee,\wedge)$, state and prove the
   i) idempotent laws $L_1, L_1'$
   ii) computative laws $L_2, L_2'$
   iii) associate laws $L_3, L_3'$
   iv) absorption laws $L_4, L_4'$

17. In any distributive lattice $L$, show that $(a \vee b) \wedge (b \vee c) \wedge (c \vee a) = (a \wedge b) \vee (b \wedge c) \vee (c \wedge a)$.

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

**B.Sc. Mathematics** Degree (Semester) Examinations, April 2016
Part – IV : Skill Based Subject : Sixth Semester : Paper – III

**ASTRONOMY**
Under CBCS – Credit 2

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

## SECTION – A

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

1. Any great circle passing through celestical poles _____.
   a) Celestial Meridian b) Secondary
   c) Small circle d) None of these
2. The longest day of a year is _____.
   a) June 21 b) December 22 c) September 23 d) March 21
3. On the equator latitude is _____.
   a) O b) W c) $90^{o}$ – W d) S
4. One lunation is _____.
   a) $14\frac{1}{2}$ *days* b) $28\frac{1}{2}$ *days* c) $29\frac{1}{2}$ *days* d) 30 days
5. Astronomy is science dealing with _____.
   a) electricity b) mathematics
   c) celestial bodies d) none of these
6. Star which are neither rising nor setting are called _____.
7. The secondaries to the equator are called _____.
8. Every celestial body describes a circle parallel to equator called _____.
9. Two kinds of eclipses are _____ and _____.
10. Cosine formula; cos *a* = _____.

## SECTION – B

**Answer ALL Questions : (4 × 10 = 40)**

11. a) What are different zones into which earth is divided.

**(OR)**

b) Write short notes on i) celestial sphere ii) cardinal points

12. a) Explain morning star and evening star.

**(OR)**

b) Explain about circumpolar.

13. a) Explain about i) Harvest moon ii) Hunters moon

**(OR)**

b) Explain about ecliptic limits.

14. a) Write short notes on
   i) Age of moon ii) Conjunction iii) Opposition

**(OR)**

b) Write short notes on
   i) Lunar eclipses ii) Solar eclipses iii) Annular eclipses

## SECTION – C

**Answer any TWO Questions : (2 × 12½ = 25)**

15. Describe different system of celestial co – ordinates.
16. Discuss the different phases of moon.
17. Explain about Terrestial latitudes and longitudes.

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