VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]
B.Sc. (Phy. / Chem.) Degree (Semester) Examinations, April 2015
Part – III : Allied Subject : Second Semester : Paper – II

MATHEMATICS – II
Under CBCS – Credit 4

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

SECTION – A

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

1. The order and degree of the differential equation $\frac{d^2y}{dx^2}-\left[\frac{dy}{dx}+\frac{d^3y}{dx^3}\right]^{3/2}=0$ respectively are
   a) 3, 3 b) 3, 2 c) 3, 1 d) 2, 3
2. The first order differential equation is said to be linear in y if the power of terms $\frac{dy}{dx}$ and y are respectively
   a) 1, 0 b) 1, 1 c) 0, 1 d) none
3. The particular integral of the differential equation $\left(D^2-4D+13\right)y=e^{-3x}$ is _____.
   a) $\frac{e^{-3x}}{34}$ b) $\frac{e^{3x}}{34}$ c) $\frac{e^{3x}}{10}$ d) $\frac{e^{3x}}{9}$
4. The complimentary function of $\left(D^2+9\right)y=\cos x$ is _____.
   a) $y=Ae^{3x}\cos 3x$ b) $y=A\cos 3x+B\sin 3x$
   c) $y=\left(A+B\right)\sin 3x$ d) $y=A\cos^3 x+B\sin^3 x$
5. $L\left(\cos ax\right)=$ _____.
   a) $\frac{s}{\left(s^2-a^2\right)}$ b) $\frac{s}{\left(s^2+a^2\right)}$ c) $\frac{a}{\left(s^2-a^2\right)}$ d) $\frac{a}{\left(s^2+a^2\right)}$

SECTION – C

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

16. Solve $\frac{dy}{dx}=\frac{\left(y^3+3x^2y\right)}{\left(x^3+2y^2x\right)}$.

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

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

    b) Find $L^{-1}\left(\frac{\left(s^2-s+2\right)}{\left[s\left(s-3\right)\left(s+2\right)\right]}\right)$.

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

20. Find the Fourier series for the function $f\left(x\right)=x^2$ where $-\pi\le x\le\pi$ and deduce that $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots\ldots=\frac{\pi^2}{6}$.

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6. $L^{-1}\left(\frac{1}{(s-a)}\right) =$ _____.

a) e^{ax} b) $\cos ax$ c) $x\, e^{ax}$ d) $\cosh ax$

7. The PDE obtained by eliminating a *and* b from $z = ax + by + ab$ is _____.

a) $z = px + qy + pq$ b) $z = px + qy$

c) $z = py + qx + pq$ d) $z = py + qx$

8. The general solution of $p\sqrt{x} + q\sqrt{y} = \sqrt{z}$ is _____.

a) $\Phi\left(\sqrt{x} - \sqrt{y},\ \sqrt{y} - \sqrt{z}\right) = 0$ b) $\Phi\left(\sqrt{x} + \sqrt{y},\ \sqrt{y} + \sqrt{z}\right) = 0$

c) $\Phi\left(\frac{1}{\sqrt{x}} + \frac{1}{\sqrt{y}},\ \frac{1}{\sqrt{y}} + \frac{1}{\sqrt{z}}\right) = 0$ d) $\Phi\left(\frac{1}{x} - \frac{1}{y},\ \frac{1}{y} - \frac{1}{z}\right) = 0$

9. *If* $f(x)$ is an even function then

a) $\int_{-a}^{a} f(x)\,dx = 2\int_{0}^{a} f(x)\,dx$ b) $\int_{-a}^{a} f(x)\,dx = \int_{0}^{a} f(x)\,dx$

c) $\int_{-a}^{a} f(x)\,dx = 0$ d) $\int_{-a}^{a} f(x)\,dx = \int_{0}^{-a} f(x)\,dx$

10. The Fourier coefficient a_0 for $f(x) = e^{x}$ in $(0, 2\Pi)$ is

a) $\frac{\left(e^{2\Pi} - 1\right)}{\Pi}$ b) $\frac{\left(e^{2\Pi} - 1\right)}{2\Pi}$ c) $\frac{\left(e^{\Pi} - e^{-\Pi}\right)}{\Pi}$ d) 0

SECTION – B

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

11. a) Solve $\frac{dy}{dx} + \frac{\left(1 + y^2\right)}{\left(1 + x^2\right)} = 0.$

(OR)

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

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

(OR)

b) Solve $x^2 y'' + 4xy' + 2y = e^{x}.$

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

(OR)

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

14. a) Eliminating the arbitrary functions f *and* g from the PDE

$Z = f(x + ay) + g(x - ay).$

(OR)

b) Solve $p\cot x + q\cot y = \cot z.$

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

(OR)

b) Obtain the cosine series for $f(x) = e^{x}$ *in* $0 < x < \pi.$

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. _____ reduce the length and complexity of program.
   a) Function b) pointer c) array d) string
2. _____ is the collection of elements of functions and variables.
   a) class b) object c) array d) structure
3. _____ has the same name as class.
   a) function b) object c) constructor d) Files
4. Which operator cannot be overloaded?
   a) :: b) + c) * d) >>
5. Creating many classes form only one class is _____ inheritance.
   a) single b) multiple c) multilevel d) hierarchical
6. What is function overloading?
7. Define class.
8. What is an array?
9. What is operator overloading?
10. Define Inheritance

SECTION – B

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

11. a) Explain call by reference with suitable example.
    (OR)
    b) Explain any five math library functions in C++.
12. a) Explain the concept of friend functions in C++.
    (OR)
    b) How to specify a class and define member functions?
13. a) Explain the concept of destructors with suitable example.
    (OR)
    b) Write a C++ program to add two complex numbers using constructors.
14. a) Write down the rules for overloading operators.
    (OR)
    b) Write a C++ program to overload the binary operator '-'.
15. a) Write a note on abstract class.
    (OR)
    b) Explain the concept of virtual base class.

SECTION – C

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

16. Explain the basic concept of OOPS.
17. Explain any two conditional statements in C++.
18. Explain the types of constructors.
19. Write a C++ program to overload binary operator '+'.
20. Explain any two types of inheritance with suitable example.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. $\int_a^b f(x)dx =$
   a) $f(b)-f(a)$ b) $F(a)-F(b)$
   c) $F(b)-F(a)$ d) $f(a)-f(b)$

2. The value of $\int \frac{dx}{x^2+a^2}$ is
   a) $\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)$ b) $\tan^{-1}\left(\frac{x}{a}\right)$ c) $\frac{1}{a}\tan^{-1}(x)$ d) None

3. *If* $f(x)$ is odd function then $\int_{-a}^{a} f(x)dx$ is
   a) 0 b) $\int_0^a f(x)dx$ c) $2\int_0^a f(x)dx$ d) None

4. The value of $\int xe^x dx$ is
   a) $e^x(x-1)$ b) xe^x c) $(x-1)$ d) None

5. The value of $\int_0^\infty e^{-x^2}dx$ is
   a) π b) $\sqrt{\pi}$ c) $\frac{\sqrt{\pi}}{2}$ d) None

6. $\lceil(n+1) =$
   a) $\lceil(n)$ b) $n\lceil(n)$ *if* $n<0$
   c) $n\lceil(n)$ *if* $n>0$ d) None

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

a) 1 b) 2 c) 0 d) None

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

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

9. *If* $f(x)$ is _____function then a_0 *and* a_n values are zero.

a) odd b) even c) odd and even d) None

10. *If* $f(x)=c$ then the value of a_0 in 0 *to* 2π is

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

SECTION – B

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

11. a) Evaluate $\int \frac{dx}{(x+1)\sqrt{(x^2+x+1)}}$. **(OR)**

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

12. a) Find the reduction formula for $\int \sin^n x dx$ and also evaluate $\int_0^{\frac{\pi}{2}} \sin^n x dx$. **(OR)**

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

13. a) Evaluate $\iint (x^2+y^2)dxdy$ over the region for which x, y are each ≥ 0 *and* $x+y\leq 1$. **(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 cardioid $r=a(1+\cos\theta)$.

(OR)

b) Given that $x+y=u,\ y=uv,$ change the variables to u, v in the integral $\iint \left[xy(1-x-y)\right]^{\frac{1}{2}} dxdy$ 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 $f(x)=x,\ -\pi\leq x\leq\pi$.

(OR)

b) Find the Half range Fourier cosine series for $f(x)=x^2$ 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 $\int_0^{\frac{\pi}{2}} \log\sin x\ dx=\frac{\pi}{2}\log\left(\frac{1}{2}\right)$.

18. Obtain the relationship between beta and gamma function.

19. Evaluate $\iiint xyzdxdydz$ taken through the positive octant of the sphere $x^2+y^2+z^2=a^2$.

20. Find the Fourier series for $f(x)=e^x\ (0,2\pi)$.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
Part – III : Core Subject : Second Semester : Paper – II

ANALYTICAL GEOMETRY (3D) & VECTOR CALCULUS

Under CBCS – Credit 4

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

SECTION – A

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

1. The equation of the zx plane is _____.
   a) $y=0$ b) $z=0$ c) $z=0$ d) $z=x=0$
2. The bisector of the acute angle makes with either of the plane which is
   a) Less than 45° b) greater than 45° c) 90° d) 180°
3. The angle between the lines whose direction ratios are $1,3,-1$ *and* $-1,2,5$ is _____.
   a) 0 b) 45° c) 30° d)90°
4. *If* l,m,n *and* l',m',n' are the direction cosines of two straight lines then the lines are perpendicular *if* _____.
   a) $ll'+mm'+nn'=0$ b) $\frac{l}{l'}=\frac{m}{m'}=\frac{n}{n'}$
   c) $ll'+mm'+nn'=p$ d) $l^2l'^2+m^2m'^2+n^2n'^2=0$
5. The curve of intersection of two sphere is
   a) a circle b) an ellipse c) a plane d) a parabola
6. Centre and radius of the sphere $x^2+y^2+z^2-ax-by-cz-d=0$ _____.
   a) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right);\left(\frac{\sqrt{a^2+b^2+c^2+d}}{2}\right)$

SECTION – C

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

16. Find the bisector of the acute angle between the planes
    $3x+4y-5z+1=0$ *and* $5x+12y-13z=0.$

17. Find the shortest distance between the lines
    $2x-2y+3z-12=0=2x+2y+z$ *and* $2x-z=0=5x-2y+9.$

18. *If* r is the radius of the circle given by
    $S: x^2+y^2+z^2+2ux+2vy+2wz+d=0$ *and* $\pi: lx+my+nz=0$
    prove that
    $\left(r^2+d\right)\left(l^2+m^2+n^2\right)=\left(mw-nv\right)^2+\left(nu-lw\right)^2+\left(lv-mu\right)^2.$

19. Show that
    $\vec{f}=\left(y^2-z^2+3yz-2x\right)\vec{i}+\left(3xz+2xy\right)\vec{j}+\left(3xy-2xz+2z\right)\vec{k}$
    is both irrotational and solenoidal vector.

20. Verify Gauss divergence theorem for the vector function
    $\vec{f}=\left(x^3-yz\right)\vec{i}-2x^2y\vec{j}+2\vec{k}$ over the cube bounded by
    $x=0;\ y=0;\ z=0;\ x=a;\ y=a;\ z=a.$

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b) $\left(\frac{-a}{2},\frac{-b}{2},\frac{-c}{2}\right)$; $\left(\frac{\sqrt{a^2+b^2+c^2+4d}}{2}\right)$

c) (a,b,c); $\sqrt{\left(a^2+b^2+c^2+d\right)}$

d) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$; $\left(\frac{\sqrt{a^2+b^2+c^2+4d}}{2}\right)$

7. A vector function $\vec{f}$ is called if_____.

a) $div\ \vec{f}=0$ b) $curl\ \vec{f}=0$ c) $curl\ \vec{f}\neq 0$ d) $div\ \vec{f}\neq 0$

8. *If* $\vec{f}=xy\vec{i}+yz\vec{j}+zx\vec{k}$ then $curl\ \vec{f}$ is _____.

a) $y\vec{i}+z\vec{j}+x\vec{k}$ b) $-y\vec{i}-z\vec{j}-x\vec{k}$ c) $x\vec{i}+y\vec{j}+z\vec{k}$ d) $y\vec{i}+z\vec{j}-x\vec{k}$

9. $\int_C \vec{f}.d\vec{r}$ is called

a) line integral b) work done c) a & b d) None

10. Stoke's theorem connects_____.

a) line integral and double integral

b) line integral and surface integral

c) Surface integral and double integral

d) Surface integral and volume integral

SECTION – B

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

11. a) The angle between two lines whose direction cosines are l,m,n *and* l_1,m_1,n_1 respectively is given by $\cos\theta=ll_1+mm_1+nn_1$.

(OR)

b) Find the equation of the plane passing through the points $(1,1,0),(1,2,1),(-2,2,-1)$.

12. a) Find the angle between the lines $x-2y+z=0=x+y-z-3$ and $x+2y+z-5=0=8x+12y+5z$.

(OR)

b) Show that the lines $\frac{x-2}{1}=\frac{y-4}{2}=\frac{z-5}{2}$ *and* $\frac{x-5}{2}=\frac{y-8}{3}=\frac{z-7}{2}$ are coplanar and find the equation of the planes containing them.

13. a) Find the equation of the sphere through the circle $S: x^2+y^2+z^2-4=0$ *and* $S_1: x^2+y^2+z^2+4x-2y+4z-10=0$ and through the point $(2,1,1)$.

(OR)

b) Prove that the two spheres $S: x^2+y^2+z^2-2x+4y-4z=0$ and $S_2: x^2+y^2+z^2+10x+2z+10=0$ touch each other and find the point of contact.

14. a) *If* $\vec{r}$ is the position vector of any point $P(x,y,z)$. Prove that grad $r^n=nr^{n-2}\ \vec{r}$.

(OR)

b) Prove that $div\left(r^n\ \vec{r}\right)=(n+3)r^n$ Deduce that $r^n\ \vec{r}$ is solenoidal iff $n=-3$.

15. a) Find the work done by the force $\vec{F}=3xy\vec{i}-5z\vec{j}+10x\vec{k}$ along the curve C, $x=t^2+1$; $y=2t^2$, $z=t^3$ from $t=1$ *to* $t=2$.

(OR)

b) Evaluate $\int_C \vec{f}.d\vec{r}$ where $\vec{f}=\left(x^2+y^2\right)\vec{i}-2xy\vec{j}$ and the *curve* C is the rectangle in the $x-y$ plane bounded by $y=0$; $y=b$; $x=0$; $x=a$.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. $(a,b] = \{x / x \in R, a < x \le b\}$ is called _____ interval.

   a) open-closed b) closed-open c) closed d) open

2. *Let* $A = (0,1)$, the glb and lub of A is

   a) 1, 0 b) 0, 1 c) 0, 0 d) 1, 1

3. A sequence (a_n) is said to be monotonic increasing if _____.

   a) $a_n \ge a_{n+1}$ b) $a_n < a_{n+1}$ c) $a_n \le a_{n+1}$ d) $a_n > a_{n+1}$

4. $\lim_{n\to\infty} n^{\frac{1}{n}} =$

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

5. _____ is the example of Cauchy sequence.

   a) $\left(\frac{1}{n}\right)$ b) $(-1)^n$ c) n d) none of them

6. One of the limit point for the sequence (n^2) is

   a) 0 b) -1 c) ∞ d) -∞

7. The Harmonic series $\sum \frac{1}{n^p}$ is converges if ___ and diverges if ____.

a) $p<1, p\geq 1$ b) $p>1, p\geq 1$ c) $p>1, p\leq 1$ d) $p<1, p\leq 1$

8. In a Geometric series *if* $r>1$ then S_n value is

a) $\frac{r-1}{r^n-1}$ b) $\frac{1-r^n}{1-r}$ c) $\frac{r^n-1}{r+1}$ d) $\frac{r^n-1}{r-1}$

9. The series $\sum \frac{(-1)^n n}{2n-1}$ is _____

a) converges b) diverges c) oscillates d) none of these

10. The radius of convergence R is

a) $\lim_{n\to\infty}\left|\frac{a_{n+1}}{a_n}\right|$ b) $\lim_{n\to\infty}\left|\frac{a_n}{a_{n+1}}\right|$ c) $\lim_{n\to 0}\left|\frac{a_n}{a_{n+1}}\right|$ d) none of these

SECTION – B

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

11. a) Prove that the geometric mean of n positive real numbers, not all of them being equal, is greater than their harmonic mean.

(OR)

b) State and prove Cauchy-Schwarz inequality.

12. a) Prove that any convergent sequence is a bounded sequence.

(OR)

b) *If* $(a_n)\to a$ *and* $(b_n)\to b$ then prove that $(a_n+b_n)\to a+b.$

13. a) *If* a sequence (a_n) converges to l, then prove that every subsequences (a_{n_k}) of (a_n) also converges to l.

(OR)

b) Prove that any Cauchy sequence is a bounded sequence.

14. a) Test the convergence of the series $\sum \frac{2^n n!}{n^n}$.

(OR)

b) Test the convergence of the series $\sum \frac{n^p}{n!}(p>0)$.

15. a) Find the radius of convergence for the Binomial series.

(OR)

b) Prove that the series $\left(1-\frac{1}{2}\right)+\left(1-\frac{3}{4}\right)+\left(1-\frac{7}{8}\right)+\ldots\ldots\ldots\ldots$ converges but, when the brackets are removed, it oscillates.

SECTION – C

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

16. State and prove Triangle in equality.

17. Show that $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n=\lim_{n\to\infty}\left(1+\frac{1}{1!}+\frac{1}{2!}+\ldots\ldots\ldots\ldots+\frac{1}{n!}\right)=e.$

18. State and prove Cesaro's theorem.

19. Show that $\sum \frac{1}{4n^2-1}=\frac{1}{2}.$

20. Prove that any absolutely convergent series is convergent.

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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 maximum horizontal range is
   a) $\frac{u}{g}$ b) $\frac{u^2}{g}$ c) $\frac{g}{u}$ d) $\frac{g^2}{u}$

2. The greatest height attained by a projectile is
   a) $\frac{u^2 \sin^2 \alpha}{2g}$ b) $\frac{u^2}{2g}$ c) $\frac{\sin^2 \alpha}{2g}$ d) $\frac{u \sin \alpha}{g}$

3. The bodies are said to be inelastic if the value of e is
   a) 1 b) 0 c) 2 d) 3

4. If two equal perfectly elastic spheres impinge, they interchange their velocities in the direction of the _____.
   a) Line of centres b) curve of centres
   c) arc of centres d) distance of centres

5. A seconds pendulum is one whose period of oscillation is
   a) 1 b) 0 c) 2 d) 3

6. The periodic time of a S.H.M. is
   a) $\frac{\sqrt{\mu}}{2\pi}$ b) $\frac{\sqrt{\mu}}{\pi}$ c) $\frac{\mu}{\pi}$ d) $\frac{\mu^2}{\pi}$

7. The (p, r) equation of the spiral is
   a) $p = r \sin \alpha$ b) $p = \sin \alpha$ c) $p = r$ d) $p = r^2 \sin \alpha$

8. The pedal equation of the circle for a general position of the pole is

a) $c^2 = r^2 + a^2 - 2ap$ b) $c^2 = r^2 + a^2$

c) $c^2 = r^2 + a^2 - ap$ d) $c^2 = r^2 + a^2 + 2ap$

9. 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) $\frac{4\left(a^2+b^2\right)}{3}$

10. The _____ formula is used in moment of inertia.

a) Routh's rule b) Newton's rule

c) Archimedes principle d) None of these

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) If the greatest height attained by the particle is a quarter of its range on the horizontal plane through the point of projection, find the angle of projection.

12. a) A smooth sphere of mass m impinges obliquely on a smooth sphere of mass M which is at rest. Show that if m = eM, the directions of motion after impact are at right angles.

(OR)

b) Obtain the oblique impact of two smooth spheres.

13. a) A particle is moving with S.H.M. and while making an oscillation from one extreme position to the other, its distance from the centre of oscillation at three consecutive seconds are x_1, x_2, x_3. Prove that the period of oscillation is $\frac{2\pi}{\cos^{-1}\left(\frac{x_1+x_3}{2x_2}\right)}$.

(OR)

b) Find the composition of two S.H.Ms. of the same period and in the same straight line.

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

(OR)

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

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

(OR)

b) Find the moment of inertia of a uniform circular disc.

SECTION – C

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

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

17. Find the expression for the loss of kinetic energy due to direct impact of two smooth spheres.

18. Obtain the solution of the Simple Harmonic motion.

19. Find the law of force towards the pole under which the curve $r^n = a^n \cos\theta$ can be described.

20. State and prove the parallel axis theorem.

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[Affiliated to Madurai Kamaraj University]
B.Sc. Mathematics Degree (Semester) Examinations, April 2015
Part – III : Core Subject : Sixth Semester : Paper – I

LINEAR ALGEBRA
Under CBCS – Credit 4

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

SECTION – A

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

1. A linear transformation $T:V\to W$ is non-singular *if* T is
   a) bijection b) 1 – 1 c) onto d) none
2. Basis for C over R is
   a) $\{1\}$ b) $\{i\}$ c) $\{1,i\}$ d) $\{1,-1\}$
3. The norm of the vector $(1,1,1)$ in $V_3(R)$ with standard inner product is
   a) 1 b) 3 c) $\sqrt{3}$ d) $\frac{1}{\sqrt{3}}$
4. In an inner product space, x is orthogonal to y *if*
   a) $\langle x,y\rangle=0$ b) $\langle x,y\rangle=1$ c) $\|x\|=\|y\|$ d) $\langle x,y\rangle=\langle y,x\rangle$
5. A square matrix A is an idempotent matrix *if*
   a) $A^2=A$ b) $A^2=I$ c) $A^T=A$ d) $A^n=0$ for some n
6. The rank of the matrix $A=\begin{pmatrix}1 & 2\\ 2 & 4\end{pmatrix}$ is
   a) 4 b) 0 c) 2 d) 1
7. The system of linear equations $AX=B$ is consistent iff
   a) rank of A = rank of B b) rank of $(A,B)=0$
   c) rank of $(A,B)=1$ d) rank of A = rank of (A,B)
8. The characteristic equation of A is
   a) $|A-xI|=0$ b) $|Ax-I|=0$ c) $Ax-I=0$ d) $A-xI=0$

9. A bilinear form f defined on a vector space V is a symmetric bilinear form if for all $u, v \in V$

a) $f(u,v) = 0$ b) $f(u) = f(v)$

c) $f(u,v) = f(v,u)$ d) $f(u,v) = f(v,v)$

10. *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

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

SECTION – B

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

11. a) *Let* V be a vector space over a field F. *Let* $S, T \subseteq V$.

Prove that i) $S \subset T \Rightarrow L(S) \subset L(T)$

ii) $L(S \cup T) = L(S) + L(T)$

iii) $L(S) = S$ iff S is a subspace of V.

(OR)

b) *Let* V be a vector space over a field F. *Let* $S = \{v_1, v_2, ..., v_n\}$ span V *and* $S' = \{w_1, w_2, ..., w_m\}$ be a linearly independent set of vectors in V. Show that $m \le n$.

12. a) State and prove Schwartz's inequality and Triangle inequality.

(OR)

b) *Let* V be a finite dimensional inner product space and W be a subspace of V. Prove that V is the direct sum of W *and* $W^{\perp}$.

13. a) Show that any square matrix A can be uniquely expressed as the sum of a symmetric matrix and a skew symmetric matrix.

(OR)

b) Find the inverse of the matrix $A = \begin{pmatrix} 2 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$.

14. a) State and prove Cayley Hamilton theorem. **(OR)**

b) Show that the equations $x + y + z = 6$; $x + 2y + 3z = 14$; $x + 4y + 7z = 30$ are consistent and solve them.

15. a) 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.

(OR)

b) *Let* V be a vector space over a field F. Show that $L(V, F)$ is a vector space over F under addition and scalar multiplication.

SECTION – C

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

16. State and prove Fundamental theorem of homomorphism.
17. Show that every finite dimensional inner product space has an orthonormal basis.
18. Find the rank of the matrix $\begin{pmatrix} 1 & -1 & 0 & 2 & 1 \\ 3 & 1 & 1 & -1 & 2 \\ 4 & 0 & 1 & 0 & 3 \\ 9 & -1 & 2 & 3 & 7 \end{pmatrix}$.
19. Find the eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{pmatrix}$.
20. 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.

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Job:	J_1	J_2	J_3	J_4	J_5	J_6
Machine A:	1	3	8	5	6	3
Machine B:	5	6	3	2	2	10

(OR)

b) Use graphical method to minimize the time added to process the following jobs on the machine shown. Also calculate the total time elapsed to complete both the jobs:

Job 1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job 2	Sequence	B	C	A	D	E
	Time	5	4	3	2	6

15. a) A firm is considering replacement of a machine, whose cost price is Rs.12,200 and the scrap value Rs.200. The running (maintenance and operating) costs in rupees are found from experience to be as follows:

Year	1	2	3	4	5	6	7	8
Running cost	200	500	800	1,200	1,800	2,500	3,200	4,000

(OR)

b) A pipeline is due for repairs. It will cost Rs.10,000 and last for 3 years. Alternatively, a new pipeline can be laid at a cost of Rs.30,000 and lasts for 10 years. Assuming cost of capital to be 10% and ignoring salvage value, which alternative should be chosen?

SECTION – C

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

16. A manufacturing company purchases 9,000 parts of a machine for its annual requirements, ordering one month usage at a time. Each part costs Rs.20. The ordering cost per order is Rs.15 and carrying charges are 15% of the average inventory per year. You have been assigned to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year?

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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. The cost generally includes costs such as rent for space used for storage, interest on the money locked-up, insurance of stored equipment, production, taxes, depreciation of equipment and furniture used, etc
   a) Salvage cost b) Set-up cost c) Carrying cost d) Shortage cost
2. The economic lot size formula due to R.H.Wilson is
   a) $Q^0 = \sqrt{\frac{2DC_s}{C_1}}$ b) $Q^0 = \sqrt{\frac{2DC_1}{C_s}}$
   c) $Q^0 = \sqrt{2DC_sC_1}$ d) $Q^0 = \sqrt{\frac{2DC_1}{C_s}}$
3. In a queueing model (a/b/c) : (d/e), the third symbol c specifies
   a) number of customers b) number of servers
   c) service time distribution d) none
4. In (M/M/1) : (∞/FIFO) model, the average number of customers in the system E(n) =
   a) $\frac{1}{\mu-\lambda}$ b) $\frac{\mu}{\mu-\lambda}$ c) $\frac{\lambda}{\mu-\lambda}$ d) ρ^n
5. CPM
   a) is used for non-repetitive jobs b) is a probabilistic model
   c) incorporates statistical analysis d) is activity-oriented
6. In PERT analysis, _____ distribution is assumed.
   a) Normal b) Gamma c) Beta d) Poisson

7. Let there be n jobs to be performed one at a time on each of m machines. Then the general sequencing problem is to find the sequence out of …….possible sequences which minimize the total elapsed time between the start of job in 1st machine and completion of last job on last machine.

   a) $(n!)^m$ b) $(m!)^n$ c) n^m d) m^n

8. _____ indicates the time required by a job on each machine.

   a) Idle time b) Total elapsed time
   c) Processing order d) Processing time

9. In the case of continuous variable, the equipment should be replaced when maintenance cost _____ the average annual total cost.

   a) is less than b) is greater than c) equals d) none

10. The optimal replacement policy of the equipment after n periods is "Replace the equipments if the next period's operating cost _____ the weighted average of previous costs".

    a) is less than b) is greater than c) equals d) none

SECTION – B

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

11. a) The probability distribution of monthly sales of a certain item is as follows:

Monthly sales	0	1	2	3	4	5	6
Probability	0.02	0.05	0.3	0.27	0.2	0.1	0.06

The cost of carrying inventory is Rs.10 per unit per month. The current policy is to maintain stock of 4 items at the beginning of each month. Assuming that the cost of shortage is proportional to both time and quantity short, obtain the imputed cost of a shortage of one item for one unit of time.

(OR)

b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is Rs.2 and the set-up cost of a production run is Rs.1,800. How frequently should production run be made?

12. a) Explain the elements of queueing system. **(OR)**

    b) At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while other is given signal to leave station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady state probabilities for the various number of trains in the system. Also find the average waiting time of a new train coming into the yard.

13. a) A project consists of a series of tasks labelled A,B,….,H,I with the following relationships (W<X,Y means X and Y cannot start until W is completed; X,Y<Z means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints: A<D,E; B,D<F; C<G; B,G<H; F,G<I.

    Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows:

Task:	A	B	C	D	E	F	G	H	I
Time:	23	8	20	16	24	18	19	4	10

(OR)

    b) Write the rules of network construction.

14. a) 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. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time, T. What is the value of T?

17. Briefly explain the pure birth models follows poisson distribution.
18. A project consists of eight activities with the following relevant information:

Activity	Immediate predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D,E	3	6	15
H	F,G	1	2	3

   i) Draw the PERT network and find out the expected project completion time.
   ii) What duration will have 95% confidence for project completion?
   iii) If the average duration for activity F increases to 14 days, what will be its effect on the expected project completion time which will have 95% confidence?

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 M_1	3	8	7	4	9	8	7
Machine M_2	4	3	2	5	1	4	3
Machine M_3	6	7	5	11	5	6	12

20. Let the value of money be assumed to be 10% per year and suppose that 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 A	1,000	200	400	1,000	200	400
Machine B	1,700	100	200	300	400	500

Determine which machine should be purchased.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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 point v of degree 'o' is called _____.
   a) initial point b) end point c) isolated point d) none
2. Use Ramsey numbers, $r(3,3) =$ _____.
   a) 4 b) 2 c) 3 d) 6
3. The partition $(7,6,5,4,3,2,1)$ is _____.
   a) graphical b) not graphical c) realisation d) isomorphic
4. A closed walk of odd length contains a _____.
   a) path b) degree c) cycle d) u-v path
5. The graph $K_{m,n}$ is _____.
   a) Hamiltonian b) Eulerian c) Connected d) Non-hamiltonian
6. Every connected graph has a _____.
   a) spanning tree b) tree c) Peterson graph d) None
7. The number of perfect matchings in the complete graph K_{2n} is ____.
   a) $\frac{2n!}{2^n(n+1)!}$ b) $\frac{(2n)!}{2^n n!}$ c) $\frac{(2n-1)!}{2^{n-1}n!}$ d) $\frac{2n!}{2^{n-1}n!}$

8. The graph K_5 is _____.

a) Planar graph b) Bipartite c) non-planar d) complete

9. A graph G is n-colourable if $\chi(G)$ is _____.

a) $=n$ b) $\leq n$ c) $\geq n$ d) $<n$

10. For any graph $G, \chi \leq$ _____.

a) $\Delta+1$ b) $\frac{\Delta+1}{2}$ c) $1-\frac{\Delta}{2}$ d) $\Delta+2$

SECTION – B

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

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

(OR)

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

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

(OR)

b) Prove that for any graph G, $K \leq \lambda \leq \delta$.

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

(OR)

b) Define the terms : i) tree ii) Forest

Let G be a (p,q) graph. If G is a tree then prove that every two points of G are joined by a unique path.

14. a) Find the number of perfect matchings in the complete graph K_{2n}.

(OR)

b) Prove that the graphs K_5 *and* $K_{3,3}$ are not planar.

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

(OR)

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

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 cycle are of even length.

18. Prove that the Peterson graph is non-hamiltonian.

19. State and prove Hall's marriage problem.

20. State and prove five-colour theorem.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. For the transformation $w = az, |a| = 1$ then
   a) 0 is the only fixed point b) ∞ is the only fixed point
   c) 0, ∞ are the two fixed points d) all points are fixed

2. Four distinct points z_1, z_2, z_3, z_4 are collinear iff (z_1, z_2, z_3, z_4) is
   a) complex b) real c) integer d) rational

3. The function $f(z) = |z|^2$, then
   a) f is differentiable at $z \neq 0$ b) f is differentiable only at $z = 0$
   c) f is not differentiable d) f is continuous at every where

4. An analytic functions, any polynomial is
   a) a constant function b) an integral function
   c) an argument value d) none of these

5. $\left|\int_a^b f(t)\,dt\right|$ is
   a) $\leq \int_a^b |f(t)|\,dt$ b) $\leq \int_a^b |f(t)\,dt|$ c) $\geq \int_a^b |f(t)|\,dt$ d) $= \int_a^b |f(t)|\,dt$

6. *Let* C be the unit circle $|z| = 1$ then $\int_C \frac{e^z}{z} dz =$ _____.
   a) $2\pi i$ b) 2π c) πi d) $\frac{\pi i}{2}$

7. The expansion $1+\frac{z}{1!}+\frac{z^2}{2!}+.....+\frac{z^n}{n!}+.....=e^z$ is valid in

a) $|z|<1$ b) $|z|>1$ c) $|z|=1$ d) the entire complex plane

8. For $f(z)=\frac{\sin z}{z}$, the point $z=0$ is

a) a pole b) an isolated singularity
c) a removable singularity d) an essential singularity

9. The residue of $\frac{e^z}{z^2}$ at $z=0$ is

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

10. Use contour integration, the value of $\int_0^{2\pi}\frac{d\theta}{5\sin\theta+13}$ is

a) $\frac{\pi}{2}$ b) $\frac{2\pi}{3}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{6}$

SECTION – B

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

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

(OR)

b) Prove any BLT preserves cross ratio.

12. a) *If* $f(z)$ is analytic, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2=4|f'(z)|^2$.

(OR)

b) Prove that $f(z)=\sqrt{|xy|}$ is not differentiable at $z=0$.

13. a) Evaluate $\int_C\left(x^2-iy^2\right)dz$ whore C is the parabola $y=2x^2$ from $(1,2)$ *to* $(2,8)$.

(OR)

b) State and prove i) Liouville's theorem ii) Morera's theorem

14. a) Find the Taylor's series to represent $\frac{z^2-1}{(z+2)(z+3)}$ it $|z|<2$.

(OR)

b) State and prove Riemann's theorem.

15. Find the residue of $\frac{1}{\left(z^2+a^2\right)^2}$ at $z=ai$.

(OR)

b) State and prove the Fundamental theorem of algebra.

SECTION – C

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

16. Discuss the transformation $w=\frac{1}{z}$.

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

18. State and prove cauchy's theorem.

19. State and prove Taylor's theorem.

20. State and prove Rouche's theorem.

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SECTION – C

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

15. i) Solve the following Assignment problem.

		Man			
		1	2	3	4
Work	I	12	30	21	15
	II	18	33	9	31
	III	44	25	24	21
	IV	23	30	28	14

ii) Explain Hungarian Assignment problem method.

16. Solve graphically

Maximize $z = x_1 + x_2$ subject to

$$x_1 + 2x_2 \le 2000$$

$$x_1 + x_2 \le 1500$$

$$x_2 \le 600$$

$$x_1, x_2 \ge 0.$$

17. i) Find the mode of the following data.

Size of shoes	3	4	5	6	7	8	9	10
Number persons working	10	28	38	42	45	15	8	7

ii) Find the Standard Deviation of the following data.

Height in inches	60-62	63-65	66-68	69-71	72-74
No. of students	5	18	42	27	8

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B.A. / B.Sc. Degree (Semester) Examinations, April 2015
Part – IV : Non-Major Elective Subject : Second Semester : Paper – I

STATISTICS AND OPERATION RESEARCH

Under CBCS – Credit 2

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

SECTION – A

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

1. The Geometric mean of 2 numbers a and b is _____.
2. Find the median of the heights in c.m. of eleven students given by 66, 65, 64, 70, 61, 60, 56, 63, 60, 67, 62.
3. The marks of 10 students are 63, 65, 66, 65, 64, 65, 65, 61, 67, 68. Find the mode.
4. Write down the formula for S.D.
5. The square of the S.D. is called _____.
6. Define feasible solution.
7. Vogel's approximation method determines IBFS which is very close to the optimum solution. (True / False)
8. The assignment problem is a special case of transportation problem. (True / False)
9. Define optimum solution.
10. Linear programming problems involving two decision variable can easily be solved by graphical method. (True / False)

SECTION – B

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

11. a) Find the A.M. of the following data.

Marks	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of Students	5	6	15	10	5	4	3	2

(OR)

b) Find the median of the following data.

Class Interval	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	45-50
Frequency	8	15	39	47	52	41	28	16	4

12. a) Find the mode of the following data.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	6	29	87	181	247	263	133	43	9	2

(OR)

b) Find S.D. of the following data.

Monthly Wages	125-175	175-225	225-275	275-325	325-375	375-425	425-475	475-525	525-575
No. of Workers	2	22	19	14	3	4	6	1	1

13. a) Using Least cost method to solve the following LPP.

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

(OR)

b) Find the IBFS to the following LPP using Vogel's approximation method.

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

14. a) Solve graphically

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

$$x_1 + 2x_2 \le 2000$$

$$x_1 + x_2 \le 1500$$

$$x_2 \le 600$$

$$x_1, x_2 \ge 0.$$

(OR)

b) Explain graphical method.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. The H.C.F. of two numbers is 11 and their L.C.M. is 693. If one of the numbers is 77, the other number is _____.
   a) 99 b) 4451 c) 693 d) none

2. The L.C.M. of 148 and 185 is _____.
   a) 740 b) 37 c) 148 d) none

3. Evaluate : $\sqrt{41\sqrt{21+\sqrt{19-\sqrt{9}}}}$
   a) 3 b) 5 c) 6 d) 6.4

4. Average of first n natural numbers is _____.
   a) $\frac{n(n+1)}{2}$ b) $\frac{n+1}{2}$ c) $\frac{n}{2}$ d) none

5. Sachin is younger than Rahul by 4 years *If* their ages are in the respective ratio of $7:9$. How old Sachin?
   a) 14 years b) 18 years
   c) can not be determined d) none of these

6. The Vulgar fraction of 0.75
   a) $4/3$ b) $3/4$ c) 75 d) none

7. I gain 70 paise on Rs.70. My gain percentage is _____.
   a) 0.1% b) 1% c) 7% d) 10%

8. *If* $A:B=5:7$ *and* $B:C=6:11$ then $A:B:C$ is _____.
   a) $55:77:66$ b) $30:42:77$ c) $35:49:42$ d) none

9. *If* $x:y=2:1$ then $\left(x^2-y^2\right):\left(x^2+y^2\right)$ is _____.
   a) $3:5$ b) $5:3$ c) $1:3$ d) $3:1$

10. Evaluate : $35\div 0.07$
    a) 500 b) $35/7$ c) $7/35$ d) none

SECTION – B

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

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

(OR)

b) i) Arrange the fractions $3/5, 4/7, 8/9$ *and* $9/11$ is ascending order.

ii) Simplify: $\dfrac{0.05\times 0.05\times 0.05+0.04\times 0.04\times 0.04}{0.05\times 0.05-0.05\times 0.04+0.04\times 0.04}$.

12. a) i) Find the value of $\sqrt{3}$ upto three decimal places

ii) Find the greatest number of five digits which is a perfect square.

(OR)

b) i) The average of four consecutive even number is 27. Find the largest of these numbers.

ii) Find the average of all prime numbers between 30 and 50.

13. a) i) The ratio between the present ages of P and Q is 6 : 7. If Q is 4 years older than P. What will be the ratio of the ages of P and Q after 4 years?

ii) The ratio of the father's age to his son's age is 7 : 3. The product of their ages is 756. Find the ratio of their ages after 6 years.

(OR)

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

14. a) Alfred started a business investing Rs.45,000 After 3 months, Peter joined him with a capital of Rs.60,000. After 6 months, Ronald joined them with a capital of Rs.90,000. At the end of the year they made a profit of Rs.16,500. Find the share of each.

(OR)

b) Four milkman rented a pasture. A grazed 24 cows for 3 months, B 10 cows for 5 months, C 35 cows for 4 months and D 21 cows for three months. If A's share of rent is Rs.720. Find the total rent of the field.

SECTION – C

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

15. a) Find the H.C.F. and L.C.M. of $2/3, 8/9, 16/81$ *and* $10/27$.

b) Find the least number exactly divisible by 12, 15, 20 and 27.

16. a) Find the square root of 1471369.

b) Simplify : $\sqrt{\left[(12.1)^2-(8.1)^2\right]\div\left[(0.25)^2+(0.25)(19.95)\right]}$.

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

b) Find the average of odd numbers up to 100.

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Varieties of cow	Fodders			
	f_1	f_2	f_3	f_4
C_1	61	63	66	68
C_2	62	64	67	69
C_3	63	63	68	69

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

University	MKU	MSU
Total number of Candidates	1600	200
Pass in Physics	320	80
Pass in Chemistry	90	40
Pass in Physics & Chemistry	30	20

17. The following is the statistics showing the lives in hours of four batches of electric 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	-	-

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]
B.Sc. Mathematics Degree (Semester) Examinations, April 2015
Part – IV : Skill Based Subject : First Semester : Paper – I

APPLIED STATISTICS
Under CBCS – Credit 2

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

SECTION – A

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

1. Given n attributes, total number of class frequencies is _____.
   a) 2^n b) 3^n c) $2^n - 1$ d) none
2. Given 3 attributes, total number of negative class frequencies is _____.
   a) 2^n b) 3^3 c) $2^3 - 1$ d) none
3. A set of class frequencies is said to be _____ *if* none of them is negative.
4. A *and* B are _____ *if* $(AB) = \frac{(A)(B)}{N}$.
5. *If* $(AB) > \frac{(A)(B)}{N}$ we say that A *and* B are _____ associated.
   a) Positively b) negatively c) none d)
6. Class frequencies of type $(A),(B),(AB),(ABC)$..... are known as _____.
7. The _____ is the process of studying the variation present in the observed values as classified in to several classes.
8. Variance is independent of change of origins. (True / False)
9. _____ of order n is defined as an arrangement of n letters A, B, C..... such that each letter occurs once in each column and once in each row.

10. For n attributes $A_1, A_2, \ldots\ldots\ldots A_n$

$(A_1A_2\ldots\ldots A_n) \geq (A_1)+(A_2)+\ldots\ldots+(A_n)-(n-1)N$ where N is total number of observations. (True / False).

SECTION – B

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

11. a) Given the following positive class frequencies Find the remaining class frequencies $N=20;\ (A)=9;\ (B)=12;$

$(C)=8;\ (AB)=6;\ (BC)=4;\ (CA)=4;\ (ABC)=3.$

(OR)

b) Given $N=1200;\ (ABC)=600,\ (\alpha\beta\gamma)=50;\ (\gamma)=270;$

$(A\beta)=36;\ (B\gamma)=204;\ (A)-(\alpha)=192;\ (B)-(\beta)=620.$

Find the remaining ultimate class frequencies.

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

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

(OR)

b) Examine the consistency of following data

i) $(A)=800,\ (B)=700;\ (AB)=660,\ N=1000$

ii) $N=2100;\ (A)=1000;\ (B)=1300\ (AB)=1100$

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

i) $N=930,\ (A)=300,\ (B)=400,\ (AB)=230$

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

(OR)

b) Investigate the following data between isoculation against small box and prevention from attack.

	Attacked	Not Attacked	Total
Inoculated	25	220	245
Not Inoculated	90	160	250
Total	115	380	495

14. a) Analyse the variance in the following Latin Square.

A8	C18	B9
C9	B18	A16
B11	A10	C20

(OR)

b) A company manufacturing certain product appointed 4 salesmen S_1, S_2, S_3, S_4 is three different areas A, B *and* C. The quantity of product sold below. Carryout the analysis of variance to test whether there is significant difference in the sales of 4 Salesman.

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

SECTION – C

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

15. Three varieties of cow of same age group are treated with four different types of fodders. The yields of milk in decilitres are given below. Perform an analysis of variance and check whether there is any significant difference between the yield of different varieties of cow due to different types of fodders.

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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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. Define an antisymmetric relation.
2. Define a poset.
3. In any lattice, *if* $a \le b$, then $a \vee b =$ _____.
4. In the lattice $(N, /)$, $a \wedge b =$ _____.
5. Any chain is a distributive lattice. (True / False)
6. Any modular lattice is a distributive lattice. (True / False)
7. In any lattice, the complement of an element is unique. (True / False)
8. In a Boolean algebra, $(a \vee b)' =$ _____.
9. Define an atom in a Boolean algebra.
10. Define a Boolean homomorphism.

SECTION – B

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

11. a) Give an example of a relation which is
    i) reflexive, symmetric and transitive.
    ii) reflexive and symmetric but not transitive.
    iii) reflexive and transitive but not symmetric.
    iv) symmetric and transitive but not reflexive.
    v) reflexive but neither symmetric nor transitive.
    vi) symmetric but neither reflexive nor transitive.
    vii) transitive but neither reflexive nor symmetric.
    viii) neither reflexive nor symmetric nor transitive.

(OR)

b) Draw the diagrams of the following posets.

i) $\left(P\left(\{1,2,3\}\right),\subseteq\right)$.

ii) The set of all subgroups of V_4, the Klein's 4-group under $\subseteq$.

iii) The set of all subgroups of Z_4, the cyclic 4-group under $\subseteq$.

iv) The set of all subgroups of S_3, the symmetric group of degree 3 under $\subseteq$.

v) D_{30}, the set of all divisors of 30 under /.

12. a) Find the least element and the greatest element if they exist for the following posets.

i) $(N,\leq)$.

ii) $(Z,\leq)$.

iii) $\left(P(A),\subseteq\right)$ where A is any nonempty set.

iv) The set of all finite subsets of an infinite set A under $\subseteq$.

v) The set of all nonempty subsets of a nonempty set A under $\subseteq$.

(OR)

b) Find the l.u.b. and g.l.b. of any two elements in the following lattices.

i) $(N,\leq)$.

ii) $\left(P(S),\subseteq\right)$.

iii) The set of all subgroups of a group under $\subseteq$.

iv) The set of all normal subgroups of a group under $\subseteq$.

v) The set of all subspaces of a vector space V w.r.t. the ordering defined by "$A\leq B$" *iff* A is a subspace of B.

13. a) Let L by any nonempty set with two binary operations $\vee$ *and* $\wedge$. defined on it and satisfying

i) the idempotent laws L_1, L_1'

ii) the commutative laws L_2, L_2'

iii) the associative laws L_3, L_3' *and*

iv) the absorption laws L_4, L_4'

Then show that L is a lattice relative to a suitable definition of $\leq$ *and* $\vee,\wedge$ are the l.u.b. and g.l.b. in this lattice.

(OR)

b) In any lattice show that

$L_5: a\vee(b\wedge c)=(a\vee b)\wedge(a\vee c)$ *and*

$L_5': a\wedge(b\vee c)=(a\wedge b)\vee(a\wedge c)$ are equivalent.

14. a) Show that M_5 *and* N_5 are not distributive lattices.

(OR)

b) Show that M_5 is a modular lattice and N_5 is not a modular lattice.

SECTION – C

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

15. In any lattice $(L,\vee,\wedge)$, state and prove the

i) idempotent laws L_1, L_1'

ii) commutative laws L_2, L_2'

iii) associative laws L_3, L_3'

iv) absorption laws L_4, L_4'

16. Find all the sub-lattices of M_5 *and* N_5.

17. Draw the lattice diagram of $(D_{210},/)$, the Boolean algebra of all divisors of 210. Find the set A of all its atoms. Draw the lattice diagram of $\left(P(A),\subseteq\right)$, the Boolean algebra of all subsets of A and hence show that D_{210} is isomorphic to $P(A)$.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
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B.Sc. Mathematics Degree (Semester) Examinations, April 2015
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 the pales of circle is called _____.
   a) Secondary b) a Vertical c) equator d) ecliptic
2. The longest day of a year is
   a) June 21 b) December 22 c) September 23 d) March 21
3. Every celestial body describes a circle parallel of equator called the
   a) small circle b) diurnal path c) great circle d) non of these
4. On the equator the latitude is
   a) 0 b) ω c) $90 - \omega$ d) δ
5. Kinds of eclipses are _____.
   a) 1 b) 2 c) 3 d) 4
6. Cosine formula : $\cos a =$ _____.
7. The diurnal path of a celestial body is a circle parallel to the _____.
8. The secondaries to the equator are called _____.
9. On lunation is _____.
10. Star which are neither rising nor setting are called _____.

SECTION – B

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

11. a) Write short notes on i) Diurnal motion ii) Ecliptic
    iii) Equator iv) Cardinal points equator

(OR)

b) What are the different Zones into which the Earth is divided?

12. a) Discuss the phenomenon of perpectual day and perpectual night.

(OR)

b) Explain i) Sidereal day ii) Circumpolar stars
iii) Morning and Evening stars

13. a) Short notes on i) Lunar eclipses
    ii) Solar eclipsed iii) Age of moon

(OR)

b) Write short notes on i) Harvest moon ii) Hunters moon

14. a) Write shorts on i) Novae ii) Nebulae iii) Star Cluster

(OR)

b) Write short notes on i) Dwarfs ii) Giants iii) Conjunction

SECTION – C

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

15. Describe different system of celestial Co-ordinates.
16. Discuss the different phase of moon.
17. Explain i) Annular eclipses
    ii) Total Solar eclipsed and their importance

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