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Inter. (Part-II)-A- 2015

Roll No.__________ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. Who recongnized the term function to describe the dependence of one quantity on other?

(A) Euler (B) Leibniz (C) Langrange (D) Bohr

2. If $f(x)=x^2$, then domain of f is:

(A) real No (B) integer (C) rational No (D) irrational

3. $\underset{x\to a}{Lim}\dfrac{f(x)-f(a)}{x-a}$ is equal to:

(A) $f'(x)$ (B) $f'(a)$ (C) $f'(2)$ (D) $f'(0)$

4. If $f(x)=x^{\frac{2}{3}}$, then $f'(8)$ is equal to:

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) 3

5. The derivative of $\sqrt{x}$ at $x=a$ is:

(A) $\frac{1}{2\sqrt{a}}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{-1}{2\sqrt{a}}$

6. $\frac{d}{dx}(\sec x)$ is equal to:

(A) $\sec x \tan x$ (B) $-\sec x \tan x$ (C) $\sec^2 x$ (D) $\operatorname{cosec}^2 x$

7. $\frac{1}{1+x^2}$ is derivative of:

(A) $\sin^{-1} x$ (B) $\sec^{-1} x$ (C) $\tan^{-1} x$ (D) $\cot^{-1} x$

8. $\int x^n dx =$ for $n \neq -1$.

(A) $\frac{x^{n+1}}{n}+c$ (B) $\frac{x^{n-1}}{n-1}+c$ (C) $\frac{x^{n+1}}{n+1}+c$ (D) $n\,x^{n-1}+c$

9. $\int \ell nx\,dx$ is equal to:

(A) $x\ell nx - x$ (B) $x - x\ell nx$ (C) $x\ell nx + x$ (D) $\frac{1}{x}\ell nx$

10. $\int x\left(\sqrt{x}+1\right)dx$ is equal to:

(A) $\frac{2}{3}x^{3/2}+c$ (B) $\frac{2}{5}x^{5/2}+\frac{x^2}{2}+c$ (C) $\frac{2}{5}x^{5/2}+c$ (D) $x^{3/2}+x+c$

11. $\int a^x\,dx$ is equal to:

(A) $\frac{a^x}{\ell na}+c$ (B) $\frac{\ell na}{a^x}+c$ (C) $\frac{1}{a^x \ell na}$ (D) $a^x \ell na+c$

12. $\int_1^2 \left(x^2+1\right)dx$ is equal to:

(A) $\frac{3}{10}$ (B) 2 (C) $\frac{10}{3}$ (D) 0

13. $\int_{-\pi}^{\pi} \sin x dx$ is equal to:

(A) 1 (B) 0 (C) 2 (D) -1

14. Bisectors of angles of a triangle are:

(A) parallel (B) perpendicular (C) concurrent (D) non-concurrent

15. If $b=0$, then the line $ax+by+c=0$ is parallel to:

(A) $y-axis$ (B) $x-axis$ (C) along $x-axis$ (D) None of these

16. A function which is to be maximized or minimized is called:

(A) subjective function (B) qualitative function (C) objective function (D) quantitative function

17. Comics are the curves obtained by cutting a right circular cone by.

(A) a line (B) a plane (C) sphere (D) two lines

18. The parabola $y^2=4ax$, $a>0$ opens

(A) right (B) left (C) upward (D) downward

19. The unit vector of a vector $\underline{v}$ is:

(A) $\frac{\underline{v}}{|\underline{v}|}$ (B) $\underline{v}|\underline{v}|$ (C) $\frac{|\underline{v}|}{\sqrt{|\underline{v}|}}$ (D) $\frac{\underline{v}}{|\underline{v}|^2}$

20. The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is:

(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

oll No.________ *to be filled in by the candidate.*	**(For all sessions)**	Subject code	6	0	1	9

athematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I **2x25=50**

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the identity $\operatorname{cosec} h^2 x = \coth^2 x - 1$. ii. Evaluate the limit: $\lim\limits_{x\to\infty}\left(1+\frac{3}{x}\right)^{2x}$.

iii. Differentiate $x^{-3} + 2x^{\frac{-3}{2}} + 3$ w.r.t x. iv. Find $\frac{dy}{dx}$ if $x^2 + y^2 = a^2$.

v. Differentiate $y = e^{f(x)}$ w.r.t x. vi. Find $\frac{dy}{dx}$ if $y = \cos^{-1} x$.

vii. Find $\frac{dy}{dx}$ if $x = y \sin y$. viii. Find $\frac{dy}{dx}$ if $y = x\sqrt{\ell nx}$.

ix. Find $f'(x)$ if $f(x) = e^{\sqrt{x}-1}$. x. Differentiate $\sin h^{-1}\left(\frac{x}{2}\right)$ w.r.t x.

xi. Write Maclaurins series expension of the function $f(x)$.

xii. Determine the intervals in which $f(x) = 4 - x^2, x \in (-2,2)$ increases or decreases.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Use differential find $\frac{dy}{dx}$ for $x^2 + 2y^2 = 16$. ii. Evaluate: $\int (x+1)(x-3)\,dx$.

iii. Find: $\int (\ell nx) \times \frac{1}{x} dx$. $(x>0)$ iv. Evaluate: $\int \sec x \, dx$.

v. Evaluate: $\int (\ell nx)^2 dx$ vi. Find $\int \frac{x+2}{\sqrt{x+3}} dx$.

vii. Evaluate: $\int \frac{2a}{x^2 - a^2} dx$. $(x > a)$ viii. Evaluate: $\int_1^2 \frac{x}{x^2+2} dx$.

ix. Find area bounded by the curve $y = 4 - x^2$ and $x - axis$.

x. Solve D.E $\sin y \operatorname{cosec} x \frac{dy}{dx} = 1$.

xi. Graph the solution set of $5x - 4y \le 20$.

xii. Define convex region.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Define $y-$intercept of a line.

ii. Find the slope and inclination of the line joining points $A(-2,4), B(5,11)$.

iii. Find the equation of the line bisecting first and third quadrants.

iv. Find the points of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$.

v. Find the lines represented by $9x^2+24xy+16y^2=0$.

vi. Find the centre and radius of circle $x^2+y^2+12x-10y=0$.

vii. Find focus and vertex of parabola $x^2=-16y$.

viii. Find the centre and foci of ellipse $25x^2+9y^2=225$.

ix. Find the centre and foci of hyperbola $\frac{y^2}{16}-\frac{x^2}{9}=1$.

x. Find the unit vector in the direction of $\vec{v}=2\hat{i}-\hat{j}$.

xi. Find α so that $\left|\alpha\hat{i}+(\alpha+1)\hat{j}+2\hat{k}\right|=3$.

xii. Find the scaler $\propto$ so that the vectors $2\hat{i}+\alpha\hat{j}+5\hat{k}$ and $3\hat{i}+\hat{j}+\alpha\hat{k}$ are perpendicular.

xiii. Find the value of α so that $\alpha\hat{i}+\hat{j}$, $\hat{i}+\hat{j}+3\hat{k}$ and $2\hat{i}+\hat{j}-2\hat{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $f(x)=\frac{2x+1}{x-1}$, then find $f^{-1}(x)$ and verify that $\left(f\,0\,f^{-1}\right)x=x$.

(b) Find $f'(x)$, when $f(x)=(\ell nx)^{\ell nx}$.

6. (a) Show that $\int e^{ax}\sin bx\,dx=\frac{1}{\sqrt{a^2+b^2}}e^{ax}\sin\left(bx-\tan^{-1}\frac{b}{a}\right)+c$.

(b) Find a joint equation of the straight line through the origin and perpendicular to the

lines represented by $x^2+xy-6y^2=0$.

7. (a) Evaluate: $\int_1^3\frac{x^2-2}{x+1}dx$.

(b) Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\leq 8$; $x-y\leq 4$; $x\geq 0$, $y\geq 0$.

8. (a) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find the angle between the vectors $\bar{u}=2i-j+k$ and $\vec{v}=-i+j$.

9. (a) Write an equation of parabola with focus (1 , 2) and vertex (3 , 2).

(b) Prove vectorially $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.

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Inter. (Part-II)-A- 2016

Roll No.__________ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	7

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\frac{1}{2}\frac{d}{dx}\left[\tan^{-1}x-\cot^{-1}x\right]=$

(A) $-\frac{1}{1+x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{1}{1-x^2}$ (D) $\frac{-1}{1-x^2}$

2. If $f(x)=\tan^{-1}x$ then $f'(\cot x)=$

(A) $\cos^2 x$ (B) $\sin^2 x$ (C) $\cos ec^2 x$ (D) $\cot^2 x$

3. $\frac{d}{dx}\left[\frac{1}{\sin x}\right]=$

(A) $\frac{1}{\cos x}$ (B) $-\frac{\sin x}{\cos x}$ (C) $\cos ec^2 x$ (D) $-\cos ec\, x\cot x$

4. $\frac{d}{dx}\left(\ell n e^x\right)=$

(A) e^x (B) 1 (C) x (D) $\frac{1}{x}$

5. $\int_{-\infty}^{\infty}\frac{1}{1+x^2}dx=$

(A) π (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

6. $\int_{0}^{\pi/2}k\cos x\,dx=4$, then $k=$

(A) 5 (B) 4 (C) 2 (D) 0

7. If $g(x)=\frac{1}{x^2}(x\neq 0)$ then $gog(x)$ is equal to:

(A) 1 (B) x^2 (C) x^4 (D) $\frac{1}{x^4}$

8. The function $f(x)=\frac{2+3x}{2x}$ is not continuous at:

(A) $x=-3$ (B) $x=-\frac{2}{3}$ (C) $x=0$ (D) $x=1$

9. $\frac{1}{x}\frac{d}{dx}\left(\sin x^2\right)=$

(A) $2x\cos x^2$ (B) $\cos x^2$ (C) $2x\cos^2 x$ (D) $2\cos x^2$

10. Slope of line is 1(one) and angle made by line with $x-axis=$.

(A) 45^0 **(B)** 30^0 **(C)** 60^0 **(D)** 75^0

11. The solution set of $x<4=$

(A) $0<x<4$ **(B)** $10<x<15$ **(C)** $-\infty<x<4$ **(D)** $4<x<\infty$

12. Mid-poit of line segment joining foci of ellips is called its =

(A) centre **(B)** vertex **(C)** directrix **(D)** major-axis

13. A circle touches the two axis at (a , 0) and (0 , a) then centre of circle is =

(A) (- a , a) **(B)** (a , -a) **(C)** (a , a) **(D)** (- a , - a)

14. What is the value of $[\underline{a}\ \ \underline{b}\ \ \underline{b}]$ =

(A) 1 **(B)** -1 **(C)** 0 **(D)** 2

15. Which of triples can be direction angles of a single vector = :

(A) 90^0, 90^0, 45^0 **(B)** 0^0, 0^0, 45^0 **(C)** 45^0, 45^0, 90^0 **(D)** 30^0, 30^0, 30^0

16. $\int\frac{\sin 2x}{\sin x}dx=$

(A) $\sin 2x$ **(B)** $2\sin 2x$ **(C)** $\frac{1}{2}\sin x$ **(D)** $2\sin x$

17. $\int\frac{\ell ogx}{x}dx=$

(A) ℓogx **(B)** $\ell og(\ell ogx)$ **(C)** $\frac{(\ell ogx)^2}{2}$ **(D)** $\frac{1}{x}$

18. $\int\tan\frac{\pi}{4}dx=$

(A) $\ell n\left(\sin\frac{\pi}{4}\right)$ **(B)** 1 **(C)** $\sec^2\frac{\pi}{4}$ **(D)** $x\tan\frac{\pi}{4}$

19. $\int\frac{\sin p}{\cos^2 x}dx=$

(A) $\sin p\sec^2 x$ **(B)** $\sin p\tan x$ **(C)** $\cos p\sec^2 x$ **(D)** $\sec^2 x$

20. Centroid is a point which divides each median in ratio =

(A) 2 : 1 **(B)** 1 : 2 **(C)** 1 : 1 **(D)** 3 : 2

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Mathematics (Essay Type)

Time: 2:30 Hours

Marks: 80

Section -I

2x25=50

2. Write short answers of any eight parts from the following. 2x8=16

i. Prove that $\cosh^2 x - \sinh^2 x = 1$

ii. Evaluate: $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$.

iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2}$.

iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ If $y = \frac{x}{\ell nx}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2, 2)$.

3. Write short answers of any eight parts from the following. 2x8=16

i. Evaluate: $\int x\sqrt{x^2 - 1}\, dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y} dy \qquad y > 0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx \qquad x > 0$.

iv. Find $\int x \cos x\, dx$.

v. Evaluate: $\int e^x\left(\frac{1}{x} + \ell nx\right)dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

ix. Find the area above the $x-axis$ and the curve $y = 5 - x^2$ from $x = -1$ to $x = 2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x = 2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

4. Write short answers of any nine parts from the following. 2x9=18

i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x, y) co-ordinates of a point are $(-2, 6)$. Find (x, y) transformed co-ordinates if new origin is $o'(-3, 2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

vi. Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2 + y^2 = 16$.

viii. Find focus and vertex of parabola $y = 6x^2 - 1$.

ix. Find an equation of ellipse whose vertices are $(0, \pm 5)$ and ecentricity $3/5$.

x. Find x so that $|xi + (x+1)j + 2k| = 3$.

xi. Find unit vector perpendicular to $\vec{a} = 2i - 6j - 3k$, $\vec{b} = 4i + 3j - k$

xii. Constant force $\vec{F} = 4i + 3j + 5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i + 3j + 2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$.

(b) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ then prove that $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

6. (a) Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)} dx$.

(b) Find h such that the points $A(\sqrt{3}, -1)$, $B(0,2)$, $C(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$.

(b) Find the maximum value of $f(x) = 4x + 6y$ under the constraints

$2x - 3y \le 6$, $2x + y \ge 2$, $2x + 3y \le 12$, $x \ge 0$, $y \ge 0$

8. (a) Find equation of the tangents to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x - 4y + 5 = 0$.

(b) Find the value of α so that $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

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Mathematics (Essay Type)

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Section -I

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iii. Evaluate: $\lim_{x\to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ If $y = \frac{x}{\ell nx}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2,2)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\sqrt{x^2-1}\,dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y}dy \quad y>0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}}dx \quad x>0$.

iv. Find $\int x\cos x\,dx$

v. Evaluate: $\int e^x\left(\frac{1}{x} + \ell nx\right)dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

ix. Find the area above the $x - axis$ and the curve $y = 5 - x^2$ from $x=-1$ to $x=2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x=2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x,y) co-ordinates of a point are $(-2,6)$. Find (x,y) transformed co-ordinates if new origin is $o'(-3,2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

vi. Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2 + y^2 = 16$.

viii. Find focus and vertex of parabola $y = 6x^2 - 1$.

ix. Find an equation of ellipse whose vertices are $(0, \pm 5)$ and ecentricity $3/5$.

x. Find x so that $|xi + (x+1)j + 2k| = 3$.

xi. Find unit vector perpendicular to $\overrightarrow{a} = 2i - 6j - 3k$, $\overrightarrow{b} = 4i + 3j - k$

xii. Constant force $\overrightarrow{F} = 4i + 3j + 5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i + 3j + 2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x \to 0} \dfrac{1 - \cos 2x}{x^2}$.

(b) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ then prove that $x^2 \dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} + y = 0$.

6. (a) Evaluate: $\int \dfrac{5x+8}{(x+3)(2x-1)} dx$.

(b) Find h such that the points $A(\sqrt{3}, -1)$, $B(0,2)$, $C(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$.

(b) Find the maximum value of $f(x) = 4x + 6y$ under the constraints

$2x - 3y \le 6$, $2x + y \ge 2$, $2x + 3y \le 12$, $x \ge 0$, $y \ge 0$

8. (a) Find equation of the tangents to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x - 4y + 5 = 0$.

(b) Find the value of α so that $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

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Roll No.__________ *to be filled in by the candidate.*   **(For all sessions)**   **Paper Code** | 8 | 1 | 9 | 1 |

Mathematics (Objective Type)   Group-I

Time: 30 Minutes   **Marks: 20**

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1-1. If $f(x)$ is continuous at point $x=a$, then.

(A) $f(a)=\lim_{x\to a} f(x)$ (B) $f(a)=\lim_{x\to 0} f(x)$ (C) $f(0)=\lim_{x\to a} f(x)$ (D) $f(x)=\lim_{x\to a} f(x)$

2. $\lim_{x\to 0}\dfrac{\sin bx}{\sin ax}$ is equal to:

(A) $-a/b$ (B) $-b/a$ (C) a/b (D) b/a

3. $\dfrac{d}{dx}(\cos^{-1}x)$ is equal to:

(A) $\dfrac{1}{\sqrt{1-x^2}}$ (B) $\dfrac{-1}{\sqrt{1-x^2}}$ (C) $\dfrac{1}{1+x^2}$ (D) $\dfrac{-1}{1+x^2}$

4. $\dfrac{d}{dx}(\sec hx)$ is equal to:

(A) $\sec x\tan x$ (B) $-\sec x\tan x$ (C) $-\sec hx\tanh x$ (D) $\sec hx\tanh x$

5. Let $y=\cos(ax+b)$, then y_2 equals.

(A) ay (B) $-ay$ (C) a^2y (D) $-a^2y$

6. The critical value of $f(x)=x^2-x-2$ equals.

(A) $\dfrac{1}{2}$ (B) $\dfrac{-1}{2}$ (C) 2 (D) -2

7. If $y=\sin^{-1}\sqrt{x}$, then $\dfrac{dy}{dx}$ equals.

(A) $\dfrac{1}{2\sqrt{x}\sqrt{1-x^2}}$ (B) $\dfrac{-1}{2\sqrt{x}\sqrt{1-x^2}}$ (C) $\dfrac{1}{2\sqrt{x}\sqrt{1-x}}$ (D) $\dfrac{1}{\sqrt{x}\sqrt{1-x}}$

8. $\int\dfrac{f'(x)}{f(x)}dx$ equals.

(A) $\ln f'(x)$ (B) $\ln f(x)$ (C) $f(x)$ (D) $f'(x)$

9. $\int\cot x\,dx$ is equal to:

(A) $\ln\sin x$ (B) $\ln\cos x$ (C) $-\ln\sin x$ (D) $-\ln\cos x$

10. $\int \tan^2 x\,dx$ is equal to:

(A) $2\tan x$ (B) $2\tan x + x$ (C) $\tan x + x$ (D) $\tan x - x$

11. $\int e^{ax}\left[af(x)+f'(x)\right]dx$ is equal to:

(A) $e^{ax}f'(x)$ (B) $e^{ax}f(x)$ (C) $e^{ax}.a\ f'(x)$ (D) $e^{ax}.a\ f(x)$

12. $\int_0^1 (3-x)\,dx$ equals:

(A) $3/2$ (B) $2/3$ (C) $5/2$ (D) $2/5$

13. Inclination of line joining two points (-2 , 4) and (5 , 11) equals:

(A) $\pi/3$ (B) $\pi/4$ (C) $\pi/6$ (D) $\pi/2$

14. Two lines represented by $ax^2+2hxy+by^2=0$ will be perpendicular if:

(A) $h^2+ab=0$ (B) $h^2-ab=0$ (C) $a-b=0$ (D) $a+b=0$

15. Perpendicular distance of point P(6,-1) from line $3x+4y+1=0$ equals:

(A) 1 (B) 2 (C) 3 (D) 4

16. (0 , 0) lies in the solution set of inequality.

(A) $x+2y\le 10$ (B) $x+2y\ge 10$ (C) $x+2y\ge 1$ (D) $x-2y\ge 10$

17. The co-ordinates of vertices of hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ equals:

(A) $(0,\pm b)$ (B) $(\pm b,0)$ (C) $(0,\pm a)$ (D) $(\pm a,0)$

18. The co-ordinates of centre of circle $x^2+y^2-6x+4y+13=0$ is equal to:

(A) (-3 , 2) (B) (3 , -2) (C) (3 , 2) (D) (-3 , -2)

19. Vector triple product of three non zero vectors $\underline{a},\underline{b}$ and $\underline{c}$ is denoted by:

(A) $\underline{a}\times(\underline{b}\times\underline{c})$ (B) $\underline{a}.(\underline{b}\times\underline{c})$ (C) $\underline{a}.(\underline{b}+\underline{c})$ (D) $\underline{a}.(\underline{b}-\underline{c})$

20. $\left[2\ \underline{k}\ \underline{j}\ \underline{i}\right]$ is equal to:

(A) 1 (B) -1 (C) -2 (D) 2

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Roll No.__________ *to be filled in by the candidate.* **(For all sessions)**

Mathematics (Essay Type) Group-I

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\lim_{x\to 2}\frac{\sqrt{x}-\sqrt{2}}{x-2}$.

ii. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ w.r.t x.

iii. Find $\frac{dy}{dx}$,when $y=\sqrt{x+\sqrt{x}}$.

iv. Differentiate $x^2\sec 4x$ w.r.t x.

v. Find $\frac{dy}{dx}$,if $x=y\sin y$.

vi. Find $f'(x)$ if $f(x)=x^2\ln\sqrt{x}$.

vii. Find y_2 If $y=\cos^3 x$.

viii. Find $\frac{dy}{dx}$ If $y=xe^{\sin x}$.

ix. Apply maclaurin's series expansion to prove that $e^x=1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+.........$.

x. Discuss continuity of function $f(x)\begin{cases}2x+5 & if\ x\le 2\\ 4x+1 & if\ x>2\end{cases}$ at $x=2$.

xi. Determine the function $f(x)=x^3+x$ as an even or odd function.

xii. Determine the intervals in which $f(x)=\cos x: x\in\left(-\pi/2, \pi/2\right)$ is increasing or decreasing function.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\frac{e^{2x}+e^x}{e^x}dx$.

ii. Evaluate: $\int\cos 3x\sin 2x\,dx$.

iii. Evaluate: $\int\frac{x+b}{(x^2+2bx+c)^{1/2}}dx$.

iv. Evaluate: $\int e^{-x}(\cos x-\sin x)dx$.

v. Evaluate: $\int_0^3\frac{1}{x^2+9}dx$.

vi. Evaluate: $\int_2^{\sqrt{5}}x\sqrt{x^2-1}\,dx$.

vii. What is the linear programming?

viii. Solve the differentional equation $\frac{1}{x}\frac{dy}{dx}=\frac{(1+y^2)}{2}$.

ix. Using differentional, find $\frac{dy}{dx}$ in the equation $x^2+2y^2=16$.

x. Using differentional to find the value of $\sqrt[4]{17}$.

xi. Find the area bounded by $\cos x$ function from $x=\frac{-\pi}{2}$ to $x=\frac{\pi}{2}$.

xii. Graph the solution set of the linear inequality $x+y\ge 5$ by shading.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find co-ordinates of the point that divides the join of A(-6,3) and B(5,-2) in the ratio 2:3.

ii. Find the slope and inclination of the line joining the points (4,6) and (4,8).

iii. Convert $2x-4y+11=0$ in normal form.

iv. Find an equation of the line through the point (2,-9) and intersection of the lines $2x+5y-8=0, 3x$-

v. Find whether the point (5,8) lies above or below the line $2x-3y+6=0$.

vi. Find the centre and radius of the circle $5x^2+5y^2+14x+12y-10=0$.

vii. Determine whether the point P(-5,6) lies outside, on, or inside the circle $x^2+y^2+4x-6y-12=0$.

viii. Find focus and vertex of parabola $y^2=-8(x-3)$.

ix. Find foci and eccentricity of the ellipse $25x^2+9y^2=225$.

x. Find direction cosines of the vector $\underline{r}=x\underline{i}+y\underline{j}+z\underline{k}$.

xi. Find a vector of length 5, in the direction opposite to the vector $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$.

xii. If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

xiii. Find the value of α, so that the vectors $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ and $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. **10x3=**

5. (a) Evaluate: $\lim\limits_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) If $x=\sin\theta$, $y=\sin(m\theta)$ then prove that $(1-x^2)y_2-xy_1+m^2y=0$.

6. (a) Evaluate: $\displaystyle\int\frac{\sqrt{2}}{\sin x+\cos x}dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$ and $y-$intercepts of each is 3.

7. (a) Evaluate: $\displaystyle\int_{-1}^{5}|x-3|dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Show that the lines $3x-2y=0$ and $2x+3y-13=0$ are tangent to the circle $x^2+y^2+6x-4y=0$.

(b) Prove that, by vector method $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$.

9. (a) Find centre, foci and vertices of the hyperbola $\dfrac{(x-1)^2}{2}-\dfrac{(y-1)^2}{9}=1$

(b) Find volume of the tetrahedron whose vertices are A(2,1,8), B(3,2,9), C(2,1,4) and D(3,3,0).

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Roll No.__________ to be filled in by the candidate.

(For all sessions)

Paper Code	8	1	9	2

Mathematics (Objective Type) Group-II

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\tan hx$ is equal to:

(A) $\frac{e^{-x}+e^{x}}{e^{x}-e^{-x}}$ (B) $\frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$ (C) $\frac{e^{-x}-e^{x}}{e^{x}+e^{-x}}$ (D) $\frac{e^{-x}+e^{x}}{2}$

2. $\lim_{x\to 0}\frac{x}{\tan x}$ is equal to:

(A) 0 (B) 1 (C) ∞ (D) $\frac{1}{2}$

3. $\lim_{x\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}$ is equal to:

(A) e (B) $\sqrt{e}$ (C) 0 (D) $\frac{1}{e}$

4. $\frac{d}{dx}\left(x^{3}+4\right)^{\frac{1}{3}}$ is equal to:

(A) $x\left(x^{3}+4\right)^{\frac{-3}{2}}$ (B) $\left(x^{3}+4\right)^{\frac{-2}{3}}2x^{2}$ (C) $x^{2}\left(x^{3}+4\right)^{\frac{-2}{3}}$ (D) $\left(x^{3}+4\right)^{\frac{4}{3}}$

5. If $f(x)=\frac{2}{x^{3}}$ then $f'(2)$ is equal to:

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$ (C) $\frac{1}{4}$ (D) $\frac{-3}{8}$

6. $\frac{d}{dx}fog(x)=$

(A) $f'[g(x)]g'(x)$ (B) $f[g(x)]g'(x)$ (C) $f'[g'(x)]$ (D) $f'(x).g'(x)$

7. $\frac{d}{dx}a^{\lambda x}=$

(A) $\lambda a^{\lambda x}\ell na$ (B) $a^{\lambda x}\ell na$ (C) $\frac{a^{\lambda x}}{\ell na}$ (D) $\frac{a^{\lambda x}}{\lambda}$

8. $\int \ell nx\,dx=$

(A) $x-x\ell nx+c$ (B) $x\ell nx+x+c$ (C) $\frac{1}{x}+c$ (D) $x\ell nx-x+c$

9. $\int \sin 2x\,dx=$

(A) $\frac{-\cos 2x}{2}$ (B) $\frac{\cos 2x}{2}$ (C) $2\cos 2x$ (D) $-2\cos 2x$

10. $\int \frac{1}{x^2+9} dx =$

(A) $\frac{1}{3}\sin^{-1}\frac{x}{3}$ (B) $\frac{1}{3}\tan^{-1}\frac{x}{3}$ (C) $\frac{1}{3}\cos^{-1}\frac{x}{3}$ (D) $\tan^{-1}\frac{x}{3}$

11. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x \, dx =$

(A) 0 (B) 1 (C) 2 (D) -2

12. $ydx + xdy = 0$

(A) $\frac{x}{y} = c$ (B) $\frac{y}{x} = c$ (C) $xy = c$ (D) $x + y = c$

13. If $ax^2 + 2hxy + by^2 = 0$ is homogeneous equation then pair of lines are real and coincident if:

(A) $h^2 - ab > 0$ (B) $h^2 - ab < 0$ (C) $h^2 - ab = 0$ (D) $h + a + b = 0$

14. Two lines having slope m_1 and m_2 are perpendicular if:

(A) $m_1 = - m_2$ (B) $1 + m_1 m_2 = 0$ (C) $m_1 m_2 = 1$ (D) $m_1 m_2 = 0$

15. The point (3,-8) lies in the quadrant.

(A) I (B) II (C) III (D) IV

16. If $x = -3$ satisfies.

(A) $x + 3 > 2$ (B) $x + 3 > -2$ (C) $3x > 0$ (D) $x + 2 > 5$

17. If $x^2 + y^2 + 2gx + 2fy + c = 0$ represents equation of circle then radius $r =$.

(A) $\sqrt{g^2 + f^2 + c}$ (B) $\sqrt{g^2 - f^2 - c}$ (C) $\sqrt{g^2 - f^2 + c}$ (D) $\sqrt{g^2 + f^2 - c}$

18. If e is eccentricity then conic represents ellipse.

(A) $e = 0$ (B) $e = 1$ (C) $e > 1$ (D) $e < 0$

19. If $\vec{v} = -\sqrt{3}/_2\, i - \frac{1}{2} j$, then $|\vec{v}| =$

(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) 4

20. The value of $i.i \times k =$

(A) 0 (B) -1 (C) j (D) 1

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Roll No.________ to be filled in by the candidate. **(For all sessions)**

Mathematics (Essay Type) Group-II

Time: 2:30 Hours **Marks: 80**

Section -I 2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Write down domain and range of $y=\sec x$.

ii. Evaluate: $\lim_{h\to 0}(1+2h)^{\frac{1}{h}}$.

iii. Evaluate: $\lim_{x\to 2}\dfrac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. If $y=\dfrac{1}{x^2}$, then find $\dfrac{dy}{dx}$ at $x=-1$.

v. Differentiate $\left(\sqrt{x}-\dfrac{1}{\sqrt{x}}\right)^2$.

vi. Differentiate $x^2.\sec 4x$.

vii. Differentiate $\sin x$ w.r.t $\cot x$.

viii. Find $\dfrac{dy}{dx}$ If $y=\sqrt{x+\sqrt{x}}$.

ix. Find $\dfrac{dy}{dx}$ If $y=\sinh^{-1}\left(x^3\right)$.

x. Find $f'(x)$ If $f(x)=\ell n\left(\sqrt{e^{2x}+e^{-2x}}\right)$.

xi. Find $\dfrac{dy}{dx}$ If $xy+y^2=2$.

xii. Find y_2 If $y=x^2e^x$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\dfrac{1}{1+\cos x}dx$.

ii. Using differential, find $\dfrac{dx}{dy}$ if $xy-\ell nx=c$.

iii. Evaluate: $\int\dfrac{\left(1-\sqrt{x}\right)^2}{\sqrt{x}}dx$, $(x>0)$.

iv. Evaluate: $\int\sec x dx$.

v. Evaluate: $\int\dfrac{\sec^2 x}{\sqrt{\tan x}}dx$.

vi. Evaluate: $\int e^{2x}\left(-\sin x+2\cos x\right)dx$.

vii. Evaluate: $\int_1^2\dfrac{x}{x^2+2}dx$.

viii. Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\cos t\, dt$.

ix. Solve the differential equation $\dfrac{dy}{dx}=\dfrac{1-x}{y}$.

x. Solve the differential equation $\sin y\,\mathrm{cosec}\,x\dfrac{dy}{dx}=1$

xi. What is an optimal solution?

xii. Graph the solution region of linear inequalities $x+y\le 5$, $y-2x\le 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the co-ordinates of point that divide the join of A(-6,3) and B(5,-2) in 2:3.

ii. The two points P(3,2) , O'(1,3) are in $xy-$ coordinates. Find P in $xy-$ coordinate system.

iii. Write the equation of line in two intercept form.

iv. Find the equation of line passing through A(-6,5) having slope 7.

v. Find the slope of the line $2x+y-3=0$.

vi. Find the radius of the circle $x^2+y^2+12x-10y=0$.

vii. Find the centre and radius of the circle $x^2+y^2=5$.

viii. Write the standard equation of Hyperbola.

ix. Find the focus and the directrix of parabola $y^2=-12x$.

x. Find a vector whose magnitude is 4 and is parallel to $2\vec{i}-3\vec{j}+6\vec{k}$.

xi. Find α so that $\left|\alpha\vec{i}+(\alpha+1)\vec{j}+2\vec{k}\right|=3$.

xii. Find $\vec{b}\times\vec{a}$, where $\vec{a}=3\vec{i}-2\vec{j}+\vec{k}$, $\vec{b}=\vec{i}+\vec{j}$.

xiii. find the value of $3\vec{j}.\vec{k}\times\vec{i}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Find the : $\lim\limits_{x\to 0}\dfrac{1-\cos px}{1-\cos qx}$.

(b) If $y=\sqrt{\tan x+\sqrt{\tan x+\sqrt{\tan x+\ldots\ldots\ldots\infty}}}$ then prove that $(2y-1)\dfrac{dy}{dx}=\sec^2 x$.

6. (a) Evaluate: $\int \tan^4 x\,dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$intercept and $y-$intercept of each is 3.

7. (a) Evaluate: $\displaystyle\int_0^{\frac{\pi}{4}}\frac{\cos\theta+\sin\theta}{2\cos^2\theta}\,d\theta$.

(b) Graph feasible region and find corner points of $2x+y\le 10$, $x+4y\le 12$, $x+y\le 10$, $x\ge 0$, $y\ge 0$.

8. (a) Find the length of chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find two vectors of length 2 parallel to the vector $\underline{v}=2\underline{i}-4\underline{j}+4\underline{k}$.

9. (a) Find the equation of ellipse with foci $\left(\pm 3\sqrt{3},0\right)$ and vertices $(\pm 6,0)$.

(b) If $\underline{a}+\underline{b}+\underline{c}=\underline{0}$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

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Inter. (Part-II)-A- 2018

Roll No.______ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Point of concurrency of medians of a triangle is called:

(A) orthocentre (B) in-centre (C) ex-centre (D) centroid

2. The lines represented by $ax^2+2hxy+by^2=0$, are real and coincident if:

(A) $h^2>ab$ (B) $h^2=ab$ (C) $h^2<ab$ (D) $h^2=a+b$

3. Equation of the line bisecting the first and third quadrant is:

(A) $y=x$ (B) $y=-x$ (C) $y=x+c$ (D) $xy=c$

4. Slope of the line which is perpendicular to the line $2x-4y+11=0$ is:

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) 2 (D) -2

5. Point (1 , 2), satisfies the inequality.

(A) $2x+y>5$ (B) $2x+y\geq 5$ (C) $2x+y<3$ (D) $2x+y<5$

6. The centre of the circle $(x+3)^2+(y-2)^2=16$, equals.

(A) $(3,-2)$ (B) $(-3,2)$ (C) $(3,2)$ (D) $(-3,-2)$

7. The eccentricity of $\frac{y^2}{4}-x^2=1$, equals.

(A) $\frac{2}{\sqrt{5}}$ (B) $\frac{-2}{\sqrt{5}}$ (C) $\frac{\sqrt{5}}{2}$ (D) $\frac{-\sqrt{5}}{2}$

8. $2i.(3j\times k)$ is equl to:

(A) 0 (B) 2 (C) 4 (D) 6

9. $\cos\theta$, equals to:

(A) $\hat{a}\,.\,\hat{b}$ (B) $|\bar{a}\times\bar{b}|$ (C) $\hat{a}\times\hat{b}$ (D) $\frac{|\bar{a}\times\bar{b}|}{|\bar{a}|}$

10. If $f(x)=\sqrt{x+4}$, then $f(x^2+4)$ is equal to:

(A) x^2-8 (B) $\sqrt{x^2-8}$ (C) $\sqrt{x^2+8}$ (D) x^2+8

11. $\underset{x \to 0}{\ell t} \dfrac{\sin 7x}{x}$ is equal to:

(A) 1 (B) 7 (C) $\dfrac{1}{7}$ (D) 0

12. $\dfrac{d}{dx} \cos^2 x$ is equal to:

(A) $-\sin^2 x$ (B) $2\sin x$ (C) $2\sin x \cos x$ (D) $-2\cos x \sin x$

13. $1 + x + \dfrac{x^2}{\underline{|2}} + \dfrac{x^3}{\underline{|3}} + \dfrac{x^4}{\underline{|4}} + \ldots\ldots$ is Maclaurin series of:

(A) e^x (B) $\sin x$ (C) $\cos x$ (D) $\ell n(1+x)$

14. If $x = at^2,\ y = 2at$, then $\dfrac{dy}{dx}$ is equal to:

(A) t (B) $\dfrac{1}{t}$ (C) t^2 (D) $\dfrac{1}{t^2}$

15. $\dfrac{d}{dx}\left(\dfrac{1}{ax+b}\right)$ is equal to:

(A) $ax+b$ (B) $\dfrac{-1}{(ax+b)^2}$ (C) $\dfrac{-a}{(ax+b)^2}$ (D) $\ell n(ax+b)$

16. If $y = \sin 3x$, then y_2 is equal to:

(A) $9\sin 3x$ (B) $-9\sin 3x$ (C) $9\cos 3x$ (D) $-9\cos 3x$

17. $\int_0^1 \dfrac{1}{\sqrt{1-x^2}} dx$ is equal to:

(A) $\dfrac{\pi}{2}$ (B) $\dfrac{\pi}{3}$ (C) $\dfrac{\pi}{4}$ (D) $\dfrac{\pi}{6}$

18. Solution of the differential equation $\dfrac{dy}{dx} = \cos x$, is:

(A) $y = \sin x + c$ (B) $y = -\sin x + c$ (C) $y = \cos x + c$ (D) $y = \ell n(\sin x) + c$

19. $\int e^{\tan x}(\sec^2 x)\,dx$ is equal to:

(A) $e^{\tan x} + c$ (B) $e^x.\tan x + c$ (C) $e^x.\sec x + c$ (D) $e^{\cot x} + c$

20. $\int_0^2 (x^2+1)\,dx$ is equal to:

(A) $\dfrac{3}{10}$ (B) $\dfrac{14}{3}$ (C) $\dfrac{5}{3}$ (D) $\dfrac{8}{3}$

Roll No.________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the identity $\operatorname{sec}h^2 x = 1 - \tanh^2 x$.

ii. Find $\overset{-1}{f}(x)$ if $f(x) = 3x^3 + 7$.

iii. Evaluate $\underset{x\to\pi}{\ell imit}\ \dfrac{\sin x}{\pi - x}$.

iv. Differentiate w.r.t x, $y = \dfrac{2x-1}{\sqrt{x^2+1}}$.

v. Find $\dfrac{dy}{dx}$, if $xy + y^2 = 2$.

vi. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

vii. Differentiate $\cos^{-1}\left(\dfrac{x}{a}\right)$ w.r.t x.

viii. Differentiate $(\ell nx)^x$ w.r.t x.

ix. Find $f'(x)$ if $f(x) = x^3 e^{\frac{1}{x}}$.

x. Find $\dfrac{dy}{dx}$, if $y = x\sqrt{\ell nx}$.

xi. Find y_2, if $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$

xii. Determine the interval in which function is increasing or decreasing

for the mentioned domain. $f(x) = \cos x : x \in \left(-\pi/2, \pi/2\right)$

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\left(\sqrt{x}+1\right)dx$.

ii. Evaluate: $\int \dfrac{1-x^2}{1+x^2}dx$.

iii. Evaluate: $\int \dfrac{-2x}{4-x^2}dx$.

iv. Evaluate: $\int e^x\left(\dfrac{1}{x} + \ell nx\right)dx$.

v. Evaluate: $\int \dfrac{2x}{1-\sin x}dx$.

vi. Evaluate: $\int_{-1}^{1}\left(x^{\frac{1}{3}}+1\right)dx$.

vii. Define the definite integral.

viii. Solve the differential equation $ydx + xdy = 0$.

ix. Define the corner point.

x. Graph the solution set of linear inequality $2x + y \le 6$.

xi. Find δy and dy in $y = x^2 + 2x$, when x changes from 2 to 1.8.

xii. Find the area between the $x-$ axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that $A(-1,h)$, $B(3,2)$ and $C(7,3)$ are collinear.

ii. Find the centroid of the triangle having vertices $(-2,3)$, $(-4,1)$ and $(3,5)$.

iii. Find an equation of the line through $(-5,-3)$ and $(9,-1)$.

iv. Find the lines represented by the homogeneous equation $3x^2+7xy+2y^2=0$.

v. Find measure of the angle between the lines represent by $x^2-xy-6y^2=0$.

vi. Find the equation of circle with centre $(\sqrt{2},-3\sqrt{3})$ and radius $2\sqrt{2}$.

vii. Find the condition that the line $y=mx+c$ may touch the circle $x^2+y^2=a^2$.

viii. Derive equation of ellipse in standard form.

ix. Find centre and foci of the $x^2-y^2=9$.

x. Let $\underline{U}=\underline{i}+2\underline{j}-\underline{k}$ and $\underline{V}=3\underline{i}-2\underline{j}+2\underline{k}$ find $|\underline{U}+2\underline{V}|$.

xi. Find α, so that $|\alpha\underline{i}+(\alpha+1)\underline{j}+2k|=3$.

xii. Find a vector perpendicular to each of the vectors $\underline{a}=2\underline{i}+\underline{j}+\underline{k}$ and $\underline{b}=4\underline{i}+2\underline{j}-\underline{k}$.

xiii. Find the value of $2\underline{i}\times 2\underline{j}.\underline{k}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) Show that $\dfrac{dy}{dx}=\dfrac{y}{x}$ if $\dfrac{y}{x}=\tan^{-1}\dfrac{x}{y}$.

6. (a) Evaluate: $\int\sqrt{x^2+4}\,dx$.

(b) Find the lines represented by equation. Also find measure of the angle between them. $2x^2+3xy-5y^2=0$.

7. (a) Evaluate: $\displaystyle\int_{1/8}^{1}\frac{\left(x^{1/3}+2\right)^2}{x^{2/3}}dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Find an equation of parabola if focus is $(-3,1)$, directrix $y=1$.

(b) Use vectors to prove that the diagonals of a parallelogram bisect each other.

9. (a) Find the centre, foci, eccentricity, vertices and directrices of $9x^2+y^2=18$.

(b) Prove that $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ by using vector method.

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Inter. (Part-II)-A- 2019

Roll No.________ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If a line "ℓ" intersect $x-axis$ at $(a,0)$, then "a" is called ______ of line "ℓ".

(A) y-intercept (B) $x-$intercept (C) slope (D) inclination

2. $y=mx+c$ is______form of equaion of line:

(A) point slope (B) intercept (C) normal (D) slope intercept

3. An equaion of line bisecting I and III quadrant is:

(A) $x=y$ (B) $x=-y$ (C) $x+2y=0$ (D) $x-2y=0$

4. $x=0$ is the solution of the inequality.

(A) $2x+1>0$ (B) $2x+1<0$ (C) $2x+1\leq 0$ (D) $2x-1<0$

5. The centre of circle $(x+1)^2+(y-2)^2=26$ is:

(A) (1 , 2) (B) (-1 , 2) (C) (-1 , -2) (D) (1 , -2)

6. The equation of directrix of the parabola $x^2=4ay$ is:

(A) $x=a$ (B) $x=-a$ (C) $y=-a$ (D) $y=a$

7. The centre of Ellipse $\frac{x^2}{4}+\frac{y^2}{1}=16$ is:

(A) (4 , 1) (B) (1 , 4) (C) (-1 , 4) (D) (0 , 0)

8. If $\underline{U}$ is any vector, then $\hat{\underline{U}}=$

(A) $\frac{|\underline{U}|}{\underline{U}}$ (B) $\frac{\underline{U}}{|\underline{U}|}$ (C) $\frac{-\underline{U}}{|\underline{U}|}$ (D) $\underline{U}\cdot|\underline{U}|$

9. If $2\underline{i}+\alpha\,\underline{j}+5\underline{k}$ and $3\underline{i}+\underline{j}+\alpha\,\underline{k}$ are perpendicular, then $\alpha=$

(A) 0 (B) 1 (C) -1 (D) 2

10. The domain of $g(x)=2x-5$ is:

(A) IR (B) the set of positive No.

(C) The set of negative real No. (D) The set of non-negative real No.

11. $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}=$

(A) e (B) e^2 (C) $e^{\frac{1}{2}}$ (D) e^3

12. $\frac{d}{dx}(x-5)(3-x)=$

(A) $2x+8$ (B) $-2x+8$ (C) $2x-8$ (D) $x+8$

13. If $3x+4y+7=0$, then $\frac{dy}{dx}=$

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{-4}{3}$ (D) $\frac{-3}{4}$

14. $\frac{d}{dx}(\sec x)=$

(A) $\sec x\tan x$ (B) $\sec x$ (C) $co\sec x$ (D) $-\sec x\tan x$

15. If $f(x)=\sin x$, then $f'(0)=$

(A) 0 (B) 1 (C) -1 (D) 2

16. Differential of y is denoted by:

(A) dy' (B) $\frac{dy}{dx}$ (C) dy (D) dx

17. $\int\frac{1}{1+x^2}e^{\tan^{-1}x}dx=$

(A) $e^{\sec x}+c$ (B) $e^{\tan x}+c$ (C) $e^{-\tan x}+c$ (D) $e^{\tan^{-1}x}+c$

18. $\int_1^e \ell nx\,dx=$

(A) -1 (B) 0 (C) 1 (D) e

19. The order of differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-3x=0$ is:

(A) 2 (B) 1 (C) 0 (D) 3

20. If a line "ℓ" is parallel to $x-axis$, then inclination=

(A) 90^0 (B) 0^0 (C) 30^0 (D) 45^0

Roll No. _______ *to be filled in by the candidate.* **(For all sessions)**

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate the limit $\lim\limits_{x\to a}\dfrac{x^n-a^n}{x^m-a^m}$.

ii. Discuss the continuity of $f(x)=\dfrac{x^2-9}{x-3}$ if $x\neq 3$.

iii. Find $\dfrac{dy}{dx}$ if $x^2-4xy-5y=0$.

iv. Prove that $\dfrac{d}{dx}\cot^{-1}x=\dfrac{-1}{1+x^2}$.

v. Find $\dfrac{dy}{dx}$ if $y=(x+1)^x$.

vi. Find y_2 If $x^2+y^2=a^2$.

vii. Find $\dfrac{dy}{d\theta}$ if $y=(\sin 2\theta-\cos 3\theta)^2$.

viii. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

ix. Find the Maclarin Series for $f(x)=\cos x$.

x. Find $f'(x)$ if $f(x)=\dfrac{e^x}{e^x+1}$.

xi. Express Area "A" of a circle as a function of its circumference "C".

xii. Determine the intervals for which $f(x)$ is decreasing and increasing $f(x)=\cos x; x\in\left(\dfrac{-\pi}{2},\dfrac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\left(\sqrt{x}+\dfrac{1}{\sqrt{x}}\right)dx$, $(x>0)$.

ii. Evaluate: $\int\sqrt{1-\cos 2x}\,dx$, $(1-\cos 2x>0)$.

iii. Evaluate: $\int(\ell nx)\times\dfrac{1}{x}\,dx$, $(x>0)$.

iv. Evaluate: $\int x\sin x\cos x\,dx$ by parts.

v. Evaluate: $\int\tan^3 x\sec x\,dx$.

vi. Evaluate: $\int\dfrac{e^{m\tan^{-1}x}}{(1+x^2)}\,dx$.

vii. Define corner point or vertex.

viii. Define feasible region.

ix. Evaluate: $\int_{-1}^{3}(x^3+3x^2)\,dx$.

x. Evaluate: $\int_{1}^{2}\dfrac{x}{x^2+2}\,dx$.

xi. Find δy and dy of the function defined as $f(x)=x^2$, when $x=2$ and $dx=0.01$.

xii. Use differentials to approximate the value of $\sqrt[4]{17}$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the points trisecting the join of A(-1,4) and B(6,2).

ii. Define inclination and slope of a line.

iii. Derive slope-intercept form of equation of straight line.

iv. Find the area of the triangular region whose vertices are A(5,3) B(-2,2) C(4,2).

v. Find equations of lines represented by $20x^2 + 17xy - 24y^2 = 0$.

vi. Find focus and directrix of the parabola $x^2 = -16y$.

vii. Write an equaion of parabola with focus (2,5) and directrix $y = 1$.

viii. Find an equation of ellipse having centre (0,0) focus (0,-3) vertex(0,4).

ix. Find centre and foci of the ellipse $x^2 + 4y^2 = 16$.

x. Find unit vector in the direction of vector $\vec{v} = \frac{1}{2}\hat{i} + \frac{\sqrt{3}}{2}\hat{j}$.

xi. Define position vector.

xii. Find a vector whose magnitude is 2 and parallel to $-\hat{i} + \hat{j} + \hat{k}$.

xiii. Write vector triple product and scalar triple product.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Prove that : $\lim_{x\to 0} \frac{a^x - 1}{x} = \log_e^a$.

(b) Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1}\frac{x}{y}$.

6. (a) Evaluate the integral: $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx$.

(b) Find k so that the line joining the points A(7,3) , B(k,-6) and the line joining the points C(-4,5), D(-6,4) are perpendicular.

7. (a) Find the area bounded by the curve $y = x(x-1)(x+1)$ and the $x-$axis

(b) Find the corner points of the feasible region intersected by the lines:

$2x + y \le 8$; $x \ge 0$
$x + 2y \le 14$; $y \ge 0$

8. (a) Find equations of the circle of radius 2 and tangent to the line $x - y - 4 = 0$ at A(1,-3).

(b) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.

9. (a) Find Eccentricity foci and directrices of hyperbola $4x^2 - 8x - y^2 - 2y - 1 = 0$.

(b) Find moment about A(1,1,1) of resultant of the concurrent forces $i - 2j$, $3i + 2j - k$, $5j + 2k$ where P(2,0,1) is their point of concurrency.

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Inter-(Part-II) -A-2021

Roll No.______ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks:20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If $g(x)=\frac{1}{x^2}, x\neq 0$ then $gog(x)$ equals.

(A) x (B) x^2 (C) x^4 (D) x^3

2. $\lim\limits_{\theta\to 0}\frac{1-\cos\theta}{\theta}$ equals.

(A) zero (B) 1 (C) 2 (D) 3

3. The derivative of $\sqrt{x}$ at $x=1$ is:

(A) $\frac{1}{2}$ (B) 2 (C) 1 (D) $\frac{-1}{2}$

4. $\frac{d}{dx}\left[\frac{1}{g(x)}\right]$ equals.

(A) $\frac{1}{g^2(x)}$ (B) $\frac{-g'(x)}{(g(x))^2}$ (C) $-g(x)$ (D) $\frac{1}{g(x)}$

5. If $y=5e^x$ then y_3 equals.

(A) $25e^x$ (B) $75e^x$ (C) $15e^x$ (D) $5e^x$

6. If $f(x+h)=\cos(x+h)$ then $f'(x)$ equals.

(A) $\cos x$ (B) $-\cos x$ (C) $-\sin x$ (D) $\sin x$

7. Inverse of $\int .... dx$ is:

(A) $\frac{d}{dy}$ (B) $\frac{d}{dx}$ (C) $\frac{dy}{dx}$ (D) $\frac{dx}{dy}$

8. $\int_a^b f(x)\,dx$ equals:

(A) $-\int_b^a f(x)\,dx$ (B) $\int_{-b}^{a} f(x)\,dx$ (C) $\int_{b}^{-a} f(x)\,dx$ (D) $\int_{a}^{-b} f(x)\,dx$

9. The general solution of $\frac{dy}{dx}=\frac{-y}{x}$ is:

(A) $xy=c$ (B) $x^2y^2=c$ (C) $\frac{x}{y}=c$ (D) $\frac{y}{x}=c$

10. $\int e^{-e}(\cos x - \sin x)\,dx$ equals:

(A) $-\bar{e}^{x}\ \sin x + c$ (B) $\bar{e}^{x}\ \cos x + c$ (C) $\bar{e}^{x}\ + c$ (D) $\bar{e}^{x}\ \sin x + c$

11. The distance of point (3,7) from x-axis is:

(A) 3 (B) 7 (C) -3 (D) -7

12. Slope of Y-axis is:

(A) zero (B) 1 (C) 2 (D) undefined

13. Equation of horizontal line through (7,-9) is:

(A) $y = -9$ (B) $y = 7$ (C) $x = -9$ (D) $x = 7$

14. (0,2) is solution of inequality.

(A) $3x + 5y > 7$ (B) $3x + 5y < 7$ (C) $x < 0$ (D) $x > 0$

15. Centre of circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is:

(A) (g, f) (B) $(-g, f)$ (C) $(0,0)$ (D) $(-g, -f)$

16. Equation of Latus rectum of parabola $x^2 = 4ay$ is:

(A) $y = -a$ (B) $y = a$ (C) $x = -a$ (D) $x = a$

17. Vertices of $\frac{x^2}{16} - \frac{y^2}{25} = 1$ are:

(A) $(0, \pm 4)$ (B) $(0, \pm 5)$ (C) $(\pm 4, 0)$ (D) $(\pm 5, 0)$

18. The non zero vectors $\underline{a}$ and $\underline{b}$ are parallel if $\underline{a} \times \underline{b}$ is:

(A) zero (B) 1 (C) 2 (D) 3

19. $\cos\theta$ equals:

(A) $\underline{a} . \underline{b}$ (B) $\underline{a} \times \underline{b}$ (C) $|\underline{a} \times \underline{b}|$ (D) $\hat{\underline{a}} . \hat{\underline{b}}$

20. If any two vectors of scalar triple product are equal then its value is:

(A) -1 (B) zero (C) 1 (D) 2

Roll No.________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. If $f(x)=x^2-x$, find (a). $f(-2)$ (b). $f(x-1)$

ii. Find $\lim\limits_{x\to 2}\dfrac{x^3-8}{x^2+x-6}$.

iii. Find $\lim\limits_{\theta\to 0}\dfrac{1-\cos\theta}{\sin\theta}$.

iv. Differentiate w.r.t "x". $\left(\sqrt{x}-\dfrac{1}{\sqrt{x}}\right)^2$.

v. Find $\dfrac{dy}{dx}$ if $3x+4y+7=0$.

vi. Differentiate w.r.t "x" $\cos\sqrt{x}+\sqrt{\sin x}$.

vii. Differentiate w.r.t "x" $\cot^{-1}\left(\dfrac{x}{a}\right)$.

viii. If $y=\log_{10}\left(ax^2+bx+c\right)$, then find $\dfrac{dy}{dx}$.

ix. If $y=x^2.e^{-x}$, then find $\dfrac{d^2y}{dx^2}$.

x. Apply Maclauren series, Prove that $\cos x=1-\dfrac{x^2}{2!}+\dfrac{x^4}{4!}+$ ________ ∞

xi. If $f(x)=\sqrt{x+1}$ and $g(x)=\dfrac{1}{x^2}$, then find (a). $(fog)(x)$ (b). $(gof)(x)$.

xii. Find the intervals in which $f(x)$ is increasing or decreasing $f(x)=\cos x,\ x\in\left(-\dfrac{\pi}{2},\dfrac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Using differential find $\dfrac{dy}{dx}$, if $x^2+2y^2=16$.

ii. Evaluate $\int x\sqrt{x^2-1}\,dx$.

iii. Evaluate $\int\dfrac{\left(1-\sqrt{x}\right)^2}{\sqrt{x}}\,dx$.

iv. Evaluate $\int\sin^2 x\,dx$.

v. Evaluate $\int\dfrac{ax+b}{ax^2+2bx+c}\,dx$.

vi. Evaluate $\int e^{3x}\left(\dfrac{3\sin x-\cos x}{\sin^2 x}\right)dx$.

vii. Sove $\dfrac{dy}{dx}=\dfrac{y^2+1}{e^{-x}}$.

viii. Find an equation of the vertical line through (-5,3).

ix. Find an equation of the line through (-5,-3),(9,-1)

x. Convert $4x+7y-2=0$ in normal form.

xi. Find the area below the curve $y=3\sqrt{x}$ and above the x-axis between $x=1$ and $x=4$.

xii. Find the mid point of the line segment joining the points A(3,1) , B(-2,-4).

4. Write short answers of any nine parts from the following. **2x9=18**

i. Graph the solution set by shading of inequality $5x-4y\le 20$.

ii. Find equation of circle with centre at $\left(\sqrt{2},-3\sqrt{3}\right)$ and radius $2\sqrt{2}$.

iii. Write equation of tangent to the circle $3x^2+3y^2+5x-13y+2=0$ at $\left(1,10/3\right)$.

iv. Find vertex of $x^2-4x-8y+4=0$.

v. Find point of intersection of conics $3x^2-4y^2=12$ and $3y^2-2x^2=7$.

vi. Find equation of parabola whose focus is F(-3,4) and directrix is $3x-4y+5=0$.

vii. Find the unit vector in the same direction of vector $\underline{V}=[3,-4]$.

viii. If $\overrightarrow{AB}=\overrightarrow{CD}$ find the co-ordinate of the point A when points B,C,D are (1,2)(-2,5) and (4,11) respectively

ix. Find $|3\underline{v}+\underline{w}|$ if $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=3\underline{i}-2\underline{j}+2\underline{k}$, $\underline{w}=5\underline{i}-\underline{j}+3\underline{k}$.

x. Find a vector of length 5 in the direction opposite that of $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$.

xi. Compute $\underline{b}\times\underline{a}$ if $\underline{b}=\underline{i}-\underline{j}+\underline{k}$, $\underline{a}=2\underline{i}+\underline{j}-\underline{k}$.

xii. Find the work done if the point at which the constant force $\vec{F}=4\underline{i}+3\underline{j}+5\underline{k}$ is applied to an object, moves from $p_1(3,1,-2)$ to $p_2(2,4,6)$.

xiii. If $\underline{a}+\underline{b}+\underline{c}=0$ then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $f(x)=\begin{cases} 3x-1 & if \quad x<1 \\ 4 & if \quad x=1 \\ 2x & if \quad x>1 \end{cases}$, then show $f(x)$ is continuous at $x=1$.

(b) If $x=\dfrac{a(1-t^2)}{1+t^2}$, $y=\dfrac{2bt}{1+t^2}$, then find $\dfrac{dy}{dx}$.

6. (a) Find the approximate increase in the volume of a cube of the length of its each edge changes from 5 to 5.02.

(b) Determine the value of P such that the lines $2x-3y-1=0, 3x-y-5=0$ and $3x+py+8=0$ meet at a point.

7. (a) Evaluate $\int_2^3\left(x-\dfrac{1}{x}\right)^2 dx$.

(b) Minimize $z=2x+y$ subject to the constraints $x+y\geq 3$, $7x+5y\leq 35$, $x\geq 0$, $y\geq 0$.

8. (a) Write equations of two tangents from (2,3) to the circle $x^2+y^2=9$.

(b) Prove by vector method $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.

9. (a) Show that $\cos(x+h)=\cos x-h\sin x-\dfrac{h^2}{2!}\cos x+\dfrac{h^3}{3!}\sin x+\ldots\ldots\ldots\ldots$

(b) Show that an equatin of the parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and directrix $x\cos\alpha+y\sin\alpha+a=0$ is $(x\sin\alpha-y\cos\alpha)^2=4a(x\cos\alpha+y\sin\alpha)$.