

Roll No.

to be filled in by the candidate

(For all sessions)

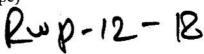
Paper Code

8

9

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

(A)
$$x^2 - 8$$

(B)
$$\sqrt{x^2-8}$$

(C)
$$\sqrt{x^2 + 8}$$

(D)
$$x^2 + 8$$

2.
$$\lim_{x \to 0} \frac{\sin 7x}{x}$$
 is equal to:

(C)
$$\frac{1}{7}$$

3.
$$\frac{d}{dx}\cos^2 x$$
 is equal to:

(A)
$$-\sin^2 x$$

(B)
$$2\sin x$$

(c)
$$2\sin x \cos x$$

(D)
$$-2\cos x \sin x$$

4.
$$1+x+\frac{x^2}{2}+\frac{x^3}{3}+\frac{x^4}{4}+\dots$$
 is Maclaurin series of:

(A)
$$e^x$$

(B)
$$\sin x$$

(C)
$$\cos x$$

(D)
$$\ell n(1+x)$$

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

(B)
$$\frac{1}{t}$$

(D)
$$\frac{1}{t^2}$$

6.
$$\frac{d}{dx} \left(\frac{1}{ax+b} \right)$$
 is equal to:

(A)
$$ax+b$$

(B)
$$\frac{-1}{(ax+b)^2}$$

(c)
$$\frac{-a}{\left(ax+b\right)^2}$$

(D)
$$\ln(ax+b)$$

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

(A)
$$9\sin 3x$$

$$-9\sin 3x$$

$$9\cos 3x$$

$$-9\cos 3x$$

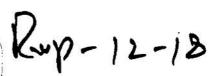
8.
$$\int_{0}^{1} \frac{1}{\sqrt{1-x^2}} dx$$
 is equal to:

(A)
$$\frac{\pi}{2}$$

(B)
$$\frac{\pi}{3}$$

(C)
$$\frac{\pi}{4}$$

(D)
$$\frac{\pi}{6}$$



- 9. Solution of the differential equation $\frac{dy}{dx} = \cos x$, is:
 - (A) $y = \sin x + c$
- (B) $y = -\sin x + c$
- (D) $y = ln(\sin x) + c$

- 10. $\int e^{\tan x} \left(\sec^2 x \right) dx$ is equal to:
 - (A) $e^{\tan x} + c$
- (B) $e^x \cdot \tan x + c$
- (C) $e^x \cdot \sec x + c$

- 11. $\int_{0}^{\infty} (x^2 + 1) dx$ is equal to:

(B) $\frac{14}{3}$

(C) $\frac{5}{3}$

- 12. Point of concurrency of medians of a triangle is called:
 - (A) orthocentre
- (B) in-centre
- (C) ex-centre
- (D) centroid
- 13. The lines represented by $ax^2 + 2hxy + by^2 = 0$, are real and coincident if:
 - (A) $h^2 > ab$
- (B) $h^2 \neq ab$
- (C) $h^2 < ab$
- (D) $h^2 = a + b$

- 14. Equation of the line bisecting the first and third quadrant is:
 - (A) y = x

- (C) y = x + c
- (D) xy = c
- 15. Slope of the line which is perpendicular to the line 2x-4y+11=0 is:
 - (A) $\frac{1}{2}$

(C) 2

(D) -2

- 16. Point (1, 2), satisfies the inequality.
 - (A) 2x + y > 5
- (B) $/2x + y \ge 5$
- (c) 2x + y < 3
- (D) 2x + y < 5
- 17. The centre of the circle $(x+3)^2 + (y-2)^2 = 16$, equals. (A) (3,-2)(B) (-3,2)(C) (3,2)18. The eccentricity of $\frac{y^2}{4} / x^2 = 1$, equals.

- (c) $\frac{\sqrt{5}}{2}$

- 19. $2i \cdot (3j \times k)$ is equal to:
 - (A) 0

(B) 2

(C) 4

(D) 6

- $20.\cos\theta$, equals to:
 - (A) $\hat{a} \cdot \hat{b}$
- (B) $|\bar{a} \times \bar{b}|$

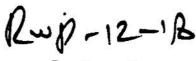
- (C) $\hat{a} \times b$

(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
$$\sec h^2 x = 1 - \tanh^2 x$$
.

ii. Find
$$f(x)$$
 if $f(x) = 3x^3 + 7$.

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

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

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

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

vii. Differentiate
$$\cos^{-1}\left(\frac{x}{a}\right)$$
 w.r.t x . viii. Differentiate $\left(\ell nx\right)^x$ 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
$$\frac{dy}{dx}$$
 if $y = x\sqrt{\ell nx}$

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

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

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

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

3. Write short answers of any eight parts from the following.

2x8=16

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

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

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

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

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

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

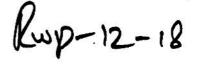
viii. Solve the differential equation
$$ydx + xdy = 0$$

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

xi. Find
$$\delta y$$
 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 $\left|\alpha \underline{i} + (\alpha + 1)j + 2k\right| = 3$.
- xii. Find a vector perpendicular to each of the vectors $\underline{a} = 2i + \underline{j} + \underline{k}$ and $\underline{b} = 4\underline{i} + 2\underline{j} \underline{k}$.
- xiii. Find the value of $2\underline{i} \times 2j\underline{k}$.

Section -II

Note: Attempt any three questions from the following.

10x3=30

- **5.** (a) Evaluate: $\lim_{\theta \to 0} \frac{\tan \theta \sin \theta}{\sin^3 \theta}$
 - (b) Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1} \frac{x}{y}$.
- **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: $\int_{\frac{1}{\sqrt{8}}}^{1} \frac{\left(x^{\frac{1}{3}} + 2\right)^2}{\sqrt{x^{\frac{2}{3}}}} dx$
 - (b) Minimize z = 5x + y subject to the constraints $3x + 5y \ge 15$, $x + 6y \ge 9$, $x \ge 0$, $y \ge 0$.
- **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.