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

Mathematics (Objective Type)

Time: 30 Minutes Rwp-12-18 **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. $\lim\limits_{x\to 0}\dfrac{\sin 7x}{x}$ is equal to:

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

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

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

4. $1+x+\dfrac{x^2}{\lfloor 2}+\dfrac{x^3}{\lfloor 3}+\dfrac{x^4}{\lfloor 4}+\ldots\ldots$ 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 $\dfrac{dy}{dx}$ is equal to:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(A) $2x + y > 5$ (B) $2x + y \geq 5$ (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) $(3,2)$ (D) $(-3,-2)$

18. 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) $\frac{-\sqrt{5}}{2}$

19. $2i.(3j \times k)$ is equl to:

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

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

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

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(For all sessions)

Mathematics (Essay Type)

Rwp-12-1B

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 $f^{-1}(x)$ 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 $(\ell nx)^x$ 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 $y = \sqrt{x} + \frac{1}{\sqrt{x}}$

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

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

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 $2x + y \leq 6$.

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 $x = 2$.

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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 $|\alpha\underline{i}+(\alpha+1)\underline{j}+2\underline{k}|=3$.

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: $\lim\limits_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$

(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: $\int_{1/8}^{1}\dfrac{\left(x^{1/3}+2\right)^2}{x^{2/3}}dx$.

(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.