Roll No. 74990 to be filled in by the candidate.

(For all sessions)

Paper Code	8	1	9	1

Mathematics (Objective Type)

RWP-21

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. $\lim_{\theta\to 0}\frac{1-\cos\theta}{\theta}$ 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) $\frac{y}{x}=c$

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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) $(0,\pm4)$ (B) $(0,\pm5)$ (C) $(\pm4,0)$ (D) $(\pm5,0)$

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

Inter - (Part-II) -A-2021

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

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours

RwP-21

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 $\ell im_{x\to 2}\dfrac{x^3-8}{x^2+x-6}$.

iii. Find $\ell im_{\theta\to 0}\dfrac{1-\cos\theta}{\sin\theta}$.

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 $y=\ell og_{10}\left(ax^2+bx+c\right)$, 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 $\left(1,\,{}^{10}\!/_{3}\right)$.

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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 $\overline{F}=4\underline{i}+3\underline{j}+5\underline{k}$ 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 $\cos(x+h)=\cos x-h\sin x-\dfrac{h^2}{2!}\cos x+\dfrac{h^3}{3!}\sin x+$............

(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 $(x\sin\alpha-y\cos\alpha)^2=4a(x\cos\alpha+y\sin\alpha)$.

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