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FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION ISLAMABAD

Answer Sheet No.________________

Sign. of Candidate ________________

Sign. of Invigilator ________________

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use **lead pencil.**

# MATHEMATICS HSSC–II
## SECTION – A (Marks 20)
## Time allowed: 25 Minutes

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

**Fill the relevant bubble against each question:**

ہر سوال کے سامنے دیے گئے درست دائرہ کو پر کریں۔

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|---|---|---|---|---|---|
| 1. | $x = a\cos\theta$, $y = b\sin\theta$ are parametric equations of: | ◯ Circle | ◯ Parabola | ◯ Ellipse | ◯ Hyperbola |
| 2. | Which of the following represents $f^{-1}(5)$ if $f(x) = x^{\frac{1}{3}} + 2$ | ◯ 1 | ◯ 3 | ◯ 9 | ◯ 27 |
| 3. | In which of the following intervals, $f(x) = 4x - 2x^2$ is increasing? | ◯ $0 \le x \le 1$ | ◯ $0 < x < 1$ | ◯ $1 \le x \le 2$ | ◯ $0 < x < 2$ |
| 4. | What result will occur, in evaluating $\lim_{x\to\infty}\left(1+\frac{2}{n}\right)^{3n}$ | ◯ $e$ | ◯ $e^2$ | ◯ $e^3$ | ◯ $e^6$ |
| 5. | For a function $f(x) = a\sin 3x$ and $f'(\frac{\pi}{3}) = 6$ then what is the value of $a$? | ◯ −2 | ◯ 2 | ◯ 3 | ◯ 6 |
| 6. | $\frac{d}{dx}(\sec^{-1}x + \operatorname{cosec}^{-1}x) =$ | ◯ −1 | ◯ 0 | ◯ 1 | ◯ 2 |
| 7. | $\int \frac{1}{\sqrt{x}} \frac{dx}{(\sqrt{x}+1)} =$ | ◯ $-\ln(\sqrt{x}+1)+c$ | ◯ $\ln(\sqrt{x}+1)+c$ | ◯ $2\ln(\sqrt{x}+1)+c$ | ◯ $-2\ln(\sqrt{x}+1)+c$ |
| 8. | Which one of the following results occurs of the integral $\int_0^2 \frac{dx}{x^2+4}$ | ◯ $\frac{\pi}{6}$ | ◯ $\frac{\pi}{8}$ | ◯ $\frac{\pi}{4}$ | ◯ $\frac{\pi}{2}$ |
| 9. | If $\int_0^2 f(x) = 3$ then what is the value of $k$ if $\int_0^2 (3f(x)+4)dx = k$ | ◯ 11 | ◯ 17 | ◯ 20 | ◯ 23 |

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| 10. | The points $A(2,5)$ and $B(3,-2)$ are the ends of a diameter of a circle, what is the radius of a circle? | ○ $2\sqrt{5}$ | ○ $5\sqrt{2}$ | ○ $\frac{5}{\sqrt{2}}$ | ○ $\frac{2}{\sqrt{5}}$ |
| 11. | A line cuts the x-axis at $(2,0)$ and y-axis at $(0,-4)$, then equation of a line is: | ○ $2x-y-4=0$ | ○ $2x-y+4=0$ | ○ $x+2y-4=0$ | ○ $x-2y+4=0$ |
| 12. | Pair of lines represented by Homogeneous equation $ax^2+2hxy+by^2=0$ through origin will be real and coincident if: | ○ $h^2>ab$ | ○ $h^2<ab$ | ○ $h^2=ab$ | ○ $a+b=0$ |
| 13. | The solution set of $2y+5>4y-3$ | ○ $y>-4$ | ○ $y>8$ | ○ $y<-4$ | ○ $y<4$ |
| 14. | The line $y=mx+c$ will be tangent to a circle $x^2+y^2=a^2$ if: | ○ $c=\pm m\sqrt{1+a^2}$ | ○ $c=\pm a\sqrt{1+m^2}$ | ○ $c=\pm m\sqrt{1-a^2}$ | ○ $c=\pm a\sqrt{1-m^2}$ |
| 15. | What is the Length of Latus Rectum of Parabola $x^2=5y$ | ○ 5 | ○ 20 | ○ $\frac{5}{4}$ | ○ 10 |
| 16. | Which one of the following represents the graph of $9x^2-18x+4y^2+8y-23=0$ ? | ○ Circle | ○ Parabola | ○ Ellipse | ○ Hyperbola |
| 17. | The co-vertices of hyperbola $\frac{x^2}{16}-\frac{y^2}{4}=1$ are: | ○ $(0,\pm4)$ | ○ $(\pm2,0)$ | ○ $(\pm4,0)$ | ○ $(0,\pm2)$ |
| 18. | The area of the triangle whose adjacent sides are $3\bar{i}+4\bar{j}$ and $12\bar{i}+9\bar{j}$ is: | ○ $\frac{45}{2}$ | ○ $\frac{21}{2}$ | ○ $\frac{55}{2}$ | ○ $\frac{25}{2}$ |
| 19. | If vectors $\bar{v}=\bar{i}-3\bar{j}+4\bar{k}$ and $\bar{w}=\lambda\bar{i}+9\bar{j}-12\bar{k}$ are parallel then what is the value of $\lambda$ ? | ○ -3 | ○ 3 | ○ -9 | ○ 9 |
| 20. | What is the volume of a parallelepiped if its edges are $2\underline{i}-4\underline{j}+5\underline{k}$, $2\underline{i}-3\underline{j}+6\underline{k}$, $-\underline{j}-\underline{k}$? | ○ 0 | ○ 3 | ○ 15 | ○ 24 |

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# MATHEMATICS HSSC–II

**Time allowed: 2:35 Hours** **Total Marks Sections B and C: 80**

**NOTE: Attempt any twelve parts from Section 'B' and any four questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Graph paper will be provided on Demand.**

## SECTION – B (Marks 48)

**Q. 2 Attempt any TWELVE parts. All parts carry equal marks.** **( 12 x 4 = 48 )**

(i) Let the real valued function, $f$ and $g$ defined by $f(x)=4x+1$ and $g(x)=2x^2+5x$ obtain the expression for:

a. $f((g))$ b. $g(f(x))$ c. $f(f(x))$ d. $g(f(x))$

(ii) Evaluate $\lim_{x\to 0}\frac{\sqrt{x+5}-\sqrt{5}}{x}$

(iii) Find $\frac{dy}{dx}$ if $x=\frac{3at}{1+t^3}$, $y=\frac{3at^2}{1+t^3}$

(iv) If $y=\tan(4\tan^{-1}\frac{x}{4})$ show that $\frac{dy}{dx}=\frac{16(1+y^2)}{16+x^2}$

(v) Use implicit rule to find the second derivative of the function $y=x+\tan^{-1}y$

(vi) If $x=\cos\theta$ ; $y=\cos n\theta$ show that $(1-x^2)y_2-xy_1+n^2y=0$

(vii) Find the area between the x-axis and the curve $f(x)=x^2-2x$ from $x=0$ to $x=3$

(viii) Evaluate $\int x^3\sqrt{1+x^2}\,dx$

(ix) Find the point two-fifth of the way along the line segment $A(-3,5)$ to $B(5,3)$.

(x) Find the angle $\theta$ form the lines $L_1$ and $L_2$: $L_1: 7x+3y-9=0$, $L_2: 5x-2y+2=0$

(xi) Graph the feasible solution region of the system of linear inequalities by shading, also find the corner points. $3x+7y\le 21$ , $x-y\le 3$, $x\ge 0$, $y\ge 0$

(xii) Find the equation of parabola with focus $(1,3)$ and vertex $(4,3)$.

(xiii) Find the equation of parabola, with Directrix, $y=3$ and vertex $(2,2)$.

(xiv) Write the equation of ellipse with vertices at $(-1,2)$ and $(7,2)$ and 2 is the length of semi minor axis whereas major axis is horizontal.

(xv) Prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$

(xvi) Find constant $\alpha$ so that vectors are coplaner $\bar{i}-\alpha\bar{j}-k$, $\bar{i}+\bar{j}+2\bar{k}$ and $\alpha\bar{i}-\bar{j}+\bar{k}$

## SECTION – C (Marks 32)

**Note:** **Attempt any FOUR questions. All questions carry equal marks.** **( 4 x 8 = 32 )**

**Q. 3** If $\theta$ is measured in radian then prove that $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$

a. Draw the figure and give explanation.

b. Find area of triangles in figure.

c. From figure, see the inequalities of area and prove the theorem.

**Q. 4** Consider the function $f(x)=\sin x+\frac{1}{\sqrt{2}}\cos 2x$ where $x\in(0,2\pi)$

find the extreme values of the functions in the interval $x\in(0,2\pi)$

a. Find function $f'(x)$

b. Find $f''(x)$

c. Find the values of $x\in(0,2\pi)$ for which $f(x)$ has maximum or minimum values

d. Find possible extreme values of $f(x)$

**Q. 5** Integrate $\int\frac{2x+5}{(x-3)^2(x^2-x+5)}dx$

a. Resolve $\frac{2x+5}{(x-3)^2(x^2-x+5)}$ into Partial fraction

b. After Partial Fraction Integrate the result $\int\frac{2x+5}{(x-3)^2(x^2-x+5)}dx$

**Q. 6** The diagram shows two Lines $L_1$ and $L_2$ passing through points:

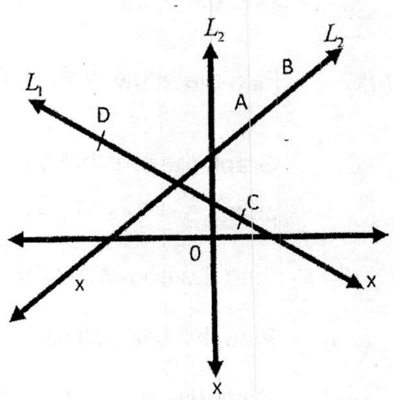
$L_1$: joins $A(2,7)$ and $B(7,10)$ $L_2$: joins $C(1,1)$ and $D(-5,3)$

a. Find the slope of lines $L_1$ and $L_2$

b. Find the angle between the lines $L_1$ and $L_2$

c. Find the equations of line $L_1$ and $L_2$

d. Find the point of contact where line $L_1$ and $L_2$ intersect




**Q. 7** Find the maximum and minimum values of $f$ and $g$ defined as $f(x)=3x+5y$ and $g(x)=6x+8y$ under the constraints. $2x-3y\le 6$ , $2x+y\ge 2$ , $2x+3y\le 12$ , $x\ge 0, y\ge 0$

**Q. 8** Find the equations of tangent and normal lines at a point $\left(3,\frac{12}{5}\right)$ to ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ For what value of $C$ the line $x+y+c=0$ will touch the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$