BOARD OF INTERMEDIATE EDUCATION, KARACHI

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MATHEMATICS PAPER-II

(MODEL PAPER)

Annual Examination 2021

(Science Pre -Engineering & Science General Groups)

Max marks: 50 **SECTION .A .(Multiple Choice Question)** **Time: 30 minutes**

NOTE: This section consists of 25 parts questions and all are to be answered

Each question carries TWO marks.

Q.1. Select the correct answer from the given options.

(i) $\lim_{x\to 2} \frac{x^2-4}{x-2}$

* 0 * 2 * 4 * - 2

(ii) If f : $\mathbb{R} \to \mathbb{R}$ is given by f(x) = x^2, then f(2) =

* 6 * 4 * -4 * 8

(iii) $\lim_{x\to\infty} \left(1+\frac{1}{x}\right)^x$ =

* 1 * e * 2 * 0

(iv) Slope of a line 3x - 5y - 15 =0 is

* $\frac{5}{3}$ * $\frac{-5}{3}$ * $\frac{-3}{5}$ * $\frac{3}{5}$

(v) General equation of a straight line is

* Y = m x + c * $\frac{x}{a}+\frac{y}{b}=1$ * y - y_1 = m (x - x_1)

* ax + by + c= 0

(vi) The point (x_1, y_1) lies below the line a x + by y + c = 0 (b> 0), if

* ax_1 + by_1 + c= 0 * ax_1 + by_1 + c < 0 * ax_1 + by_1 + c > 0

* ax_1 + by_1 + c $\geq$ 0

(vii) Altitudes of a triangle are

* perpendicular * parallel * coincident * concurrent

(viii) Intercepts of a line $3x - 2y - 6 = 0$ are

* - 2, - 3 * 2, - 3 * -2, 3 * 2, 3

(ix) Inclination of a line $y = x$ is

* 0° * 45° * 180° * 90°

(x) A function f(x) is maximum at x = a, if

* $f''(a) < 0$ * $f''(a) > 0$ * $f''(a) = 0$ * $f''(a) \neq 0$

(xi) Derivative of 2^{2x} w.r.t x is

* $2x\ 2^{2x-1}$ * $2^{2x} \ln 2$ * $4^x \ln 4$ * 2^{2x}

(xii) $\frac{d}{dx} Sin^2 x =$

* $Cos^2 x$ * $Sin2x$ * $-Cos^2 x$ * $-Sin^2 x$

(xiii) derivative of $f(x) = e^{lnx}$, then $f'(2)$

* $ln2$ * 1 * $\frac{1}{2}$ * e^{ln2}

(xiv) $\int lnx\ dx =$

* $\frac{1}{x}$ +c * x lnx + x +c * xlnx – x +c *xlnx + c

(xv) $\int (2x+3)^{-1} dx =$

* ln (2x + 3) + c * $\ln \sqrt{2x+3} + c$ * $x^2 + 3x + c$

* $\frac{1}{2} ln\sqrt{2x+3} + c$

(xvi) $\int \frac{1}{Cot\ x} dx =$

* ln Sinx + c * ln secx + c * ln cotx + c * ln tanx + c

(xvii) $\int \frac{dx}{\sqrt{1-x^2}} =$

* $\sin^{-1}x + c$ * $\cos^{-1}x + c$ * $\tan^{-1}x + c$ *$\sec^{-1}x + c$

(xviii) The equation of circle whose center lies on x-axis is

*$x^2 + y^2 + 2fy + c = 0$ * $x^2 + y^2 + 2gx + c = 0$

* $x^2 + y^2 + 2gx + 2fy = 0$ * $x^2 + y^2 + c = 0$

(xix) The equation of a circle passes through the origin is

* $x^2 + y^2 + 6y + 2 = 0$ * $x^2 + y^2 + 4x + 1 = 0$

* $x^2 + y^2 + 5x - 2y = 0$ * $x^2 + y^2 = 9$

(xx) The concentric circles have the same

* equation * radius * center * diameter

(xxi) The length of latusrectum of parabola whose vertex at origin and focus at (3, 0) is

* 6 units * 8 units * 10 units * 12 units

(xxii) If semi axes of an ellipse are 4 units and 3 units, its eccentricity is

* $\frac{\sqrt{7}}{4}$ * $\frac{\sqrt{17}}{4}$ * $\frac{\sqrt{21}}{4}$ * $\frac{\sqrt{27}}{4}$

(xxiii) In a rectangular hyperbola

* a > b * a < b * a = 2b * a = b

(xxiv) If three vectors are coplanar, then scalar triple product is

* 1 * 0 * - 1 * ± 1

(xxv) The cross product of the vectors and $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$ is

* 0 * $\hat{i} - \hat{j} + k$ * $\hat{i} + \hat{j} + k$ * $\hat{i} + \hat{j} - k$

TIME: One and Half hour **Marks: 50**

SECTION "B" (Short -Answer Questions) (30 .Marks)

Note : Answer any six part questions from this section ,selecting two parts questions from each question.

Analytical geometry and vector algebra

Q.2. (i) Find the points of trisection of the segment joining by the points (3 , 4) and (7 , 7)

(ii) By using slopes ,find the fourth vertex of a parallelogram if (1 , -2)

(1 , 0) and (2 , 1) are its three consecutive vertices.

(iii) For what value of K will the three lines $2x - 3y - 7 = 0$, $4x - 3y - 11 = 0$ and $2x + ky + 1 = 0$ be concurrent ?

(iv) Prove that $[\vec{a} + \vec{b} \quad \vec{b} + \vec{c} \quad \vec{c} + \vec{a}] = 2\,[\vec{a} \quad \vec{b} \quad \vec{c}]$

Conic section

Q.3. (i) Find the equation of a circle which passes through the origin and

Cuts off equal intercepts 3 and 4 from the axes.

(ii) Find the equation of the circle having (7 , 9) and (11 , - 7) are the

end points of a diameter.

(iii) Find the equations of the tangents at the ends of the latusrectum of the parabola $x^2 = 4ay$

(iv) If $y = \sqrt{5}\,x + k$ is a tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, what is k ?

Calculus

Q.4. (i) Evaluate any two

(a) $\lim_{x \to a} \frac{x^m - a^m}{x^n - a^n}$ (b) $\lim_{x \to 0} \frac{1 - \cos x}{\sin x}$ (c) $\lim_{x \to 0} \frac{\sqrt{4+x} - 2}{x}$

(ii) Find the derivative of $f(x) = \sin\sqrt{x}$ or $f(x) = x^3 - 2x^2 + 1$

By first principle at $x = a \in D_f$

(iii) Find $\frac{dy}{dx}$ of any two

(a) $y = \sqrt{4 - x^2} + 2 \cos^{-1}\frac{x}{2}$ (b) $y = x^{Secx}$

(c) $y = \frac{cos2x + Sin2x}{x^3+1}$

(iv) Find $\frac{dy}{dx}$ of any two

(a) $x^3 + y^3 = 3 a x y$ (b) $e^x \ln y - \tan^{-1} y = x$

(c) $x = a\cos^2\theta$, $y = b\,Sin^2\theta$

SECTION "C" (Detailed -Answer Questions) (20 Marks)

Note: Attempt any two questions from this section

Q.5.Evaluate any two

(a) $\int e^x \; Sin^2 e^x \; dx$ (b) $\int Cos^3\frac{x}{3} \; dx$

(c) $\int_0^a \frac{dx}{(a^2+x^2)^{\frac{3}{2}}}$ (d) $\int \frac{2x+3}{x+1} dx$

Q.6. (a) A line whose y -intercept is 1 less then its x – intercept forms with the coordinate axes a triangle of area 6 square units. What is Its equation ?

(b) Show that the eccentricities e_1 & e_2 of the two conjugate hyperbolas satisfy the relation $e_1^2 + e_2^2 -- e_1^2 e_2^2 = 0$

Q.7. (a) Find the relative maximum and relative minimum values of the function f : R → R is defined as

$f(x) = x^3 - 9x^2 + 15x + 3$ OR $f(x) = \frac{\ln x}{x}$

(b) Evaluate any one

(i) $\int e^x \frac{1+Sin\,x}{1+Cos\,x} dx$ (ii) $\int \frac{Sin\,x}{(1+Cos\,x)(2+Cos\,x)} dx$