BOARD OF INTERMEDIATE EDUCATION, KARACHI

H.S.C. Annual Examinations 2021

MATHEMATICS PAPER - II (MODEL PAPER)

(Science Pre-Engineering & Science General Group)

REVISED

Max marks: 50

SECTION A

(Multiple Choice Questions)

Time: 30 minutes

NOTE: This section consists of 25 part questions and all are to be answered.
Each part 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 the 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 ax + by + 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 ≥ 0

(vii) Altitudes of a triangle are :

* equal * parallel * coincident * concurrent

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

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

(ix) Inclination of the line $y = x$ is :

* 0° * 45° * 180° * 90°

(x) A function f(x) is maximum at x = a, if $f'(a) = 0$ and:

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

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

* $2x\ 2^{2x-1}$ * $2^{2x} \times ln\ 2$ * $4^x\ ln\ 4$ * $ln2\ .\ 2^{2x+1}$

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

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

(xiii) If 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) $\int \frac{1}{Cot\ x} dx$ = :

* lnSinx + 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 passing 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 :

* equations * radii * centers * diameters

(xxi) The length of latus rectum of parabola having 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 $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$:

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

(xxiv) If three vectors are coplanar, then their 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 * $\hat{i} - \hat{j} + \hat{k}$ * $\hat{i} + \hat{j} + \hat{k}$ * $\hat{i} + \hat{j} - \hat{k}$

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

SECTION B (30 Marks)

(short -Answer Questions)

Note : Answer any six part questions from this section. Selecting two part 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 Sections

Q.3. (i) Find the equation of a circle which passes through the origin and cuts off intercepts equal to 3 and 4 from the axes.

(ii) Find the equation of the circle having (7 , 9) and (11 , - 7) as end points of its diameter.

(iii) Find the equations of the tangents at the ends of the Latus rectum 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 of the following:

(a) $\lim_{x\to a} \frac{x^m - a^m}{x^n - a^n}$ (b) $\lim_{x\to 0} \frac{1 - cosx}{sinx}$

(c) $\lim_{x\to 0} \frac{\sqrt{4+x} - 2}{x}$

(ii) Find the derivative using first principle at x ϵ D_f of the following:

f(x) = $\sin\sqrt{x}$ OR f (x) = x^3 - 2 x^2 + 1

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

(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 of the following:

(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 than its x – intercept forms a triangle of area 6 square units with the coordinate axes. What is its equation ?

(b) Show that the eccentricities e_1 and e_2 of the two conjugate Hyperbolas satisfy the relation $e_1^2 + e_2^2 = e_1^2 e_2^2$

Q.7. (a) Find the relative maximum and relative minimum values of the function f : R $\rightarrow$ R 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) $\int \frac{Sin\,x}{(1+Cos\,x)(2+Cos\,x)}\,dx$