ZIAUDDIN UNIVERSITY EXAMINATION BOARD

H.S.C Annual Examinations 2021

MATHEMATICS PAPER II (MODEL PAPER)

(Science Pre-engineering & Science General Group)

SECTION "A" (Short- Answers Question)

Time: 30 minutes **Max.marks:50**

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

Q1. Select the correct answer from the given options.

i. $\lim_{x \to 0} \frac{\sin x}{x} =$
   a. 1
   b. 1/c
   c. 0
   d. c

ii. F(x) = sin x + cos x is
   a. Even function
   b. Odd function
   c. Either even nor odd function
   d. Modulus function

iii. If a line is perpendicular of y – axis then its equations is
   a. x= 0
   b. y = constant
   c. x = constant
   d. y = 0

iv. The point of intersection of internal bisectors of the angles triangle is called
   a. Incentre
   b. Centroid
   c. Orthocentre
   d. Circumcenre

v. Distance of the point (4,5) from the y –axis is
   a. 5 units
   b. 4 units
   c. 9 units
   d. 1 unit

vi. Area of triangle ABC, When A,B,C are collinear, is
   a. ∞
   b. Zero
   c. Positive
   d. Negative

vii. 3x – 5y – 15 = 0 is parallel to the line

a. 5x -3y – 15 = 0
b. 3x + y – 15 = 0
c. x – y + 15 = 0
d. 6x – 10y + 15 = 0

viii. If f (x) = sin 9x the $f'(x) =$

a. Cos 9x
b. –cos 9x
c. 9 cosx
d. 9cos 9x

ix. An antiderivative of a function is called

a. Definite integral
b. Indefinite integral
c. Summation
d. Differential

x. The necessary condition for f(x) to have extreme value is

a. f^n (x) = 0
b. f' (x) = 0
c. f(x) = 0
d. $f'(x) = 1$

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

a. $f''(a) = 0$
b. $f''(a) < 0$
c. $f''(a) > 0$
d. $f''(a) = a$

xii. $\int e^{2x}dx$:

a. $2e^{2x} + c$
b. $e^{2x} + c$
c. $e^{2x+1} + c$
d. $\frac{1}{-2}e^{2x} + c$

xiii. $\int (ax+b)^n dx, if\ n = -1, a \neq 0$:

a. $\frac{ln(ax+b)}{a} + c$
b. $\frac{(ax+b)^{n+1}}{a(n+1)} + c$
c. $\frac{(ax+b)}{(n+1)} + c$
d. None of these

xiv. $\int \frac{(1+x)}{x^2+2x} dx =$

a. In(x^2 +2x)
b. In (2x+1) + c
c. In(x^2 +2x) +c
d. In $\sqrt{x^2 + 2x + c}$

xv. $\int e^{sinx} \cos x \, dx \; is$

a. $e^{cos} + c$
b. $e^{cosx} \sin x + c$
c. $e^{sinx} \sin x + c$
d. $e^{sinx} + c$

xvi. If n = 1 , then $\int \{f(x)\}^n f'(x) dx \; is \; equal \; to$

a. $\frac{\{f(x)\}^{n+1}}{n+1} + c$
b. $\frac{\{f(x)\}^{n+1}}{n} + c$
c. $\frac{\{f(x)\}^{n+1}}{n-1} + c$
d. In f(x) + c

xvii. Which of the following circles passes through the origin

a. $x^2 + y^2 + 8x + 7 = 0$
b. $x^2 + y^2 + 8x + 11y = 0$
c. $x^2 + y^2 – 9y + 11 y = 0$
d. $x^2 + y^2 – 8x + 11y + 19 = 0$

xviii. The centre of the circle $x^2 + y^2 + 6x - 10 y + 33 = 0$ is

a. (-3,5)
b. (-3,-5)
c. (3,-5)
d. (3,5)

xix. If $b^2 = a^2 (1- e^2)$ the conic is

a. Circle
b. Parabola
c. Ellipse
d. Hyperbola

xx. If e = 1 then conic is

a. Circle
b. Ellipse
c. Parabola
d. Hyperbola

xxi. The length of latus rectum of parabola $x^2 = 4ay$ is

a. 4a
b. A
c. 4
d. |4a|

xxii. In the parabola $y^2 = 4ax$, |4a| represents

a. focus
b. vertex
c. axis
d. length of latus rectum

xxiii. If $\bar{a} . \bar{b}$= 0 then the angle between the vectors $\bar{a}$ & $\bar{b}$ is

a. 0
b. π/2
c. π/3
d. π

xxiv. $|\bar{a}|$ of a vector a when $\bar{a}$ = $P_1 P_2$ where P_1 (0,0,1) P_2(-3,1,2) is

a. $\sqrt{12}$
b. $\sqrt{10}$
c. $\sqrt{11}$
d. $\sqrt{13}$

xxv. If f(x)=lnx^3 then $f'(x) at\ x = -2\ is$

a. 2/3
b. -3/2
c. -2/3
d. 1

SECTION "B" (Short-Answers Question)

Time: 1hour 30 minutes **(30 marks)**

NOTE: Attempt any THREE questions from this section. All questions carry equal marks.

2.

(a) A is two – third the way from (1, 10) to (–8, 4) and B is the midpoint of (0, –7), (6, –11). find the distance $|AB|$.

(b) Find the derivative by the first principles at x = a in the domain D(f) of $f(x) = cos^2 x$

3.

(a) The point P (2, 3) is the foot of the perpendicular dropped from the origin to a straight line. find the equation of this line.

(b) Find the relative maximum and minimum values of the following function f(x)= e^x sinx

4.

(a) Find the equation of tangent and normal at the point (3,6) to the parabola y^2=12x

(b) Find sin ($\underline{a}$, $\underline{b}$) of the vectors $\underline{a}$ = 2i + 3j + 4k, $\underline{b}$ =i-j+k .

5.

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

(b) Evaluate any two of the following.

(i) $\lim_{x\to 1}\left(\frac{1}{1-x} - \frac{3}{1-x^3}\right)$ (ii) $\lim_{\theta\to 0}\frac{3e^{\theta}-e^{-\theta}-2}{\theta}$

(iii) $\lim_{x\to 0}\frac{\tan x - \sin x}{sin^3 x}$ (iv) $\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1-x}}{x}$

6.

(a) Evaluate $\int\frac{7x-25}{(x-3)(x-4)}$dx

OR

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

(b)Prove that the line lx+my+n=0 and the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 have just one point in common if $a^2l^2 + b^2m^2 - n^2 = 0$

Section "C" (Detailed – Answer Questions) **(20 marks)**

NOTE: Attempt two questions from this section including question number 7 which is compulsory.

7. Evaluate any Four from the following:

(i) $\int \frac{\sec x \tan x}{a+b\sec x} dx$ (ii) $\int x ln x dx$ (iii) $\int_0^2 \frac{dx}{\sqrt{1+x}-\sqrt{x}}$

(iv) $\int_0^2 (x^2+3x+5)^{\frac{-2}{3}}\left(x+\frac{3}{2}\right)dx$ (v) $\int \frac{\tan x}{\ln \cos x} dx$

8.

(a) Find the equation of a line through the intersection of the lines $x+y-1=0$ and 3x+y+3=0 and passing through (2,1).

(b) Find the equation of the line which passing through the point (-2, -4) and sum of intercepts is equal to 3.

9.

(a) Prove that the parabolas $x^2= 4ay$ and $y^2=4by$ intersect at angle $\theta=\tan^{-1}\frac{3}{2}\left(\frac{a^{1/3}\,b^{1/3}}{a^{2/3}+b^{2/3}}\right)$

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

(i) $x = \sin t^3 + \cos t^3, \qquad y = \sin t + 2\cos^{-1} t$

(ii) $y = \frac{3x^2-1}{3x^2} + \ln\sqrt{1+x^2} + \tan^{-1} x$

(iii) $e^x \ln y = \sin^{-1} y$