

HISSAN CENTRAL EXAMINATION - 2080 (2024)

Grade: XII

F.M.: 75

Time : 3 hrs

COM. MATHEMATICS (0081 D2)

Candidates are required to give their answers in their own words as far as practicable.

Attempt ALL Questions.

GROUP A

[11 × 1 = 11]

Rewrite the correct options of each questions in your answer sheet.

- How many ways can 3 geometric boxes can be distributed among 4 children where each children eligible for all geometric boxes ?
A) 7 B) 12 C) 64 D) 81
- Which one of the following is the Euler's form of $1-i$?
A) $\sqrt{2} e^{\frac{i7\pi}{4}}$ B) $2 e^{\frac{i7\pi}{4}}$ C) $\sqrt{2} e^{\frac{-i7\pi}{4}}$ D) $2 e^{\frac{-i7\pi}{4}}$
- If $\frac{\cos C}{2} = \sin A \cdot \cos B$ in a triangle ABC then the triangle has.
A) $a=b=c$ B) $a=b$ C) $b=c$ D) $c=a$
- In a conic section has equation $\frac{(x+h)^2}{a^2} + \frac{y^2}{b^2} = 1$, $b > a$ then the foci is
A) $(h, \pm be)$ B) $(h \pm ae, 0)$ C) $(-h \pm ae, 0)$ D) $(-h, \pm be)$
- Let $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$. Which one of the following is parallel to $(\vec{b} - \vec{c})$?
A) $(\vec{a} - \vec{b})$ B) $(\vec{a} - \vec{c})$ C) $(\vec{a} - \vec{d})$ D) $(\vec{c} - \vec{d})$
- If $P(A) = 0.4$, $P(B) = 0.32$ and $P(B/A) = 0.5$, which one of the following is $P(A/B)$?
A) $\frac{2}{5}$ B) $\frac{5}{8}$ C) $\frac{3}{8}$ D) $\frac{8}{25}$
- What is the value of $\int \frac{1}{a^2 - x^2} dx$?
A) $\frac{1}{a} \log \frac{x+a}{a-x} + C$ B) $\frac{1}{2a} \log \frac{x+a}{x-a} + C$
C) $\frac{1}{a} \log \frac{x-a}{a+x} + C$ D) $\frac{1}{2a} \log \frac{x+a}{a-x} + C$
- Which one of the following is equal to $\lim_{x \rightarrow 0} \frac{\tan x - x}{x - \sin x}$?
A) 0 B) 1 C) 2 D) 3

- Which one of the following is the equation tangent to curve $y = (x-1)(x-2)$ at the point on x axis ?
A) $2x + y = 0$ B) $x+y = 1$ C) $x-y = 1$ D) $x + y = 2$

- Which one of the following is order of the differential equation

$$\frac{d^4 y}{dx^4} - \left(\frac{d^5 y}{dx^5}\right)^3 + \left(\frac{dy}{dx}\right)^5 ?$$

- A) 1 B) 3 C) 4 D) 5

- In a Gauss elimination method is original equations are transformed by using
A) Row operation B) subset operation
C) column operation D) Mathematical operation

OR,

What is the maximum horizontal range of a particle thrown with the velocity of 10 m/s ? ($g = 10 \text{ m/s}^2$).

- A) 8m B) 10 m C) 15m D) 20 m

GROUP B

[8 × 5=40]

- (a) What is the sum of first n natural number? [1]
(b) Write the general term of the expansion $(a+x)^n$. [1]
(c) Write two property cube root of unity. [1]
(d) What is the magnitude of complex number $Z = e^{-i\theta}$? [1]
(e) Define permutation and combination. [1]
- (a) Find the sum to n terms of the series: $2.3 + 3.4 + 4.5 + \dots$ [2]
(b) Solve the following system of equation by using matrix method [3]
 $2x + y + 3z = 19$, $3x - 2z = -2$, $3y + 2z = 17$
- a) If $a^4 + b^4 + c^4 = 2c^2(a^2 + b^2)$, prove angle C is 45° or 135° in triangle ABC [2]
b) Find the equation of the tangent to the circle $x^2 + y^2 = 25$ drawn through the point (13,0) [3]
- a) From a cylindrical drum containing milk and kept vertical, the milk is leaking so that level of the milk is decreasing at the rate of 1.5 cm/min. If the radius and the height of the drum is 21cm and 49cm respectively, find the rate at which the volume of the milk is decreasing.
($\pi = \frac{22}{7}$) [3]
b) Find the value of $(\vec{a} \cdot \vec{b})^2 + (\vec{a} \times \vec{b})^2$ in term of a and b. [2]
- a) Write the integral of $\int \frac{1}{\sqrt{x^2 + a^2}} dx$. [1]
b) Write a differential equation in a linear form. [1]

- c) Write any three indeterminate form of function. [1]
 d) What does $\frac{dy}{dx}$ represent ? [1]
 e) Reduce the expression $\frac{2}{(x+1)(x-1)}$ into partial fraction. [1]

17. Raw materials used in production of a synthetic fiber is stored in a place that has no humidity control measurement of the humidity (relative) and the moisture content of samples of the raw materials (both in percentages) of 7 days yielded the following results.

Humidity	56	43	57	32	45	39	55
Moisture content	13	17	11	18	15	23	27

- a) Find the coefficient correlation [2]
 b) Predict the moisture content when the relative humidity is 60 percent. [3]
18. a) Find the derivative of $(\cosh^{-1} x)^x$ [2]
 b) Solve : $\frac{dy}{dx} = \frac{y+1}{x+y+1}$ [3]
19. a. If the velocity of particle when at its greatest height is $\sqrt{\frac{2}{5}}$ of its velocity when at half its greatest height, find the angle of projection. [2]
 b. Two forces X and Y acting parallel to the length and base of an inclined plane respectively, would each of them singly support a weight M on the plane ; prove that $\frac{1}{x^2} = \frac{1}{y^2} + \frac{1}{M^2}$ [3]
- OR**
- a. Solve the following system of equations by Gauss-Seidel method [2]
 $x - 4y + 6 = 0$, $5x - y = 27$
 b. Using simplex method to maximize $P(x,y) = 3x+5y$ subject to $x+2y \leq 40$; $2x+y \leq 50$, $x, y \geq 0$. [3]

GROUP C

[3 × 8=24]

20. a) From 10 gentlemen and 8 ladies a committee of 7 is to be formed. In how many ways can this be done so as to include at least 4 ladies? [3]
 b) Using principle of mathematical induction, show that :
 $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n+1)(2n-1)}{3}$ [3]
 c) Apply De-Moivre's theorem to compute $(1-i)^5$ [2]

21. a) Find the equation of tangent to the parabola $x^2 = 4ay$ at a point (x_1, y_1) on the parabola. [3]
 b) If $A = 45^\circ$, $B = 60^\circ$, show that $a:c = 2: \sqrt{3} + 1$ [2]
 c) Prove, any triangle, by vector method that $\frac{\sin A}{a} = \frac{\sin C}{c} = \frac{\sin B}{b}$ [3]
22. a) Find the point on the curve $y = 3x^2 + 4x - 5$ where the tangent is parallel to the $16x + 2y = 3$. [2]
 b) Give an example of exact differential equation, homogenous differential equation and standard integral each. [3]
 c) Define L hospital rule . Find the derivative of Arc cosh (sinh x). [1+2]

THE END