HISSAN CENTRAL EXAMINATION - 2080 (2024)

Grade : XII   **F.M.: 75**

Time : 3 hrs

COM. MATHEMATICS (0081 M2)

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.

1. The $(k+1)^{th}$ *the term of* $(x + y)^n$ is …
   a) $\binom{n}{k} x^{n-k} y^{n-k}$ b) $\binom{n}{k} x^k y^k$ c) $\binom{n}{k} (xy)^{n-k}$ d) $\binom{n}{k} x^{n-k} y^k$

2. Which one of the following is the Euler's form of $2i$?
   a) $e^{\frac{i\pi}{2}}$ b) $2 e^{\frac{i\pi}{3}}$ c) $2 e^{\frac{i\pi}{2}}$ d) $2 e^{\frac{-i\pi}{2}}$

3. If $b \cos B = c \cos C$ in a triangle ABC then the triangle is.
   a) right angled   b) equiangular   c) acute angle   d) obtuse angle

4. In a conic section has equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ then the eccentricity is
   a) $\sqrt{1 - \frac{b^2}{a^2}}$ b) $\sqrt{1 - \frac{a^2}{b^2}}$ c) $\sqrt{1 + \frac{b^2}{a^2}}$ d) $\sqrt{1 + \frac{a^2}{b^2}}$

5. Let $\vec{p} \times \vec{q} = \vec{r} \times \vec{s}$ and $\vec{p} \times \vec{r} = \vec{q} \times \vec{s}$. Which one of the following is parallel to $(\vec{q} - \vec{r})$?

   a) $(\vec{p} - \vec{q})$ b) $(\vec{p} - \vec{r})$ c) $(\vec{p} - \vec{s})$ d) $(\vec{r} - \vec{s})$

6. 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) $\frac{8}{25}$ c) $\frac{3}{8}$ d) $\frac{5}{8}$

7. What is the derivation of $\operatorname{cosech}^{-1} x$?
   a) $\frac{1}{x\sqrt{x^2+1}}$ b) $-\frac{x}{\sqrt{x^2+1}}$ c) $-\frac{1}{x\sqrt{x^2+1}}$ d) $\frac{1}{x\sqrt{x^2-1}}$

8. Which one of following is equal to $\lim_{x \to 0} \frac{x - \sin x}{x^3}$?
   a) 0   b) $\frac{1}{2}$ c) $\frac{1}{3}$ d) $\frac{1}{6}$

9. Which one of following is the angle made by the tangent to curve $y (x-2) - (x-3) = 0$ at the point on x axis ?
   a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{3\pi}{2}$ d) $\frac{5\pi}{6}$

10. Which one of following order of the differential equation $\frac{d^3y}{dx^3} - \left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4$?
    a) 1   b) 2   c) 3   d) 4

11. The system of linear equations $2x + 3y = 15$ and $4x + 6y = 30$ has...
    a) No solution   b) Infinitely many solutions
    c) One solution   d) More than one solutions but finite

OR

An automobile of mass of 1000kg is brought to rest by applying a breaking force of 2500 N. Which one of the following retardation .
a) 2.5 cm/s^2 b) 2.5 m/s^2 c) 2.5 m/s d) $- 2.5 \text{ m/s}^2$

GROUP B   **[8 × 5 = 40]**

12. $(a + x)^n = C(n,0) a^n + C(n,1) a^{n-1} x + \dots + C(n,n-1) a x^{n-1} + C(n,n) x^n$

    a) How many terms are there in expansion?   [1]

    b) Write the general term of the expansion.   [1]

    c) Write the binomial coefficients.   [1]

    d) If $a = 1$, write the above binomial in the expansion form.   [1]

    e) when n is even in above expansion, write its middle term.   [1]

13. a) If $Z = \cos\theta + i\sin\theta$, find the value of $z^n + z^{-n}$ [2]
    b) Solve the following system of equation by using matrix method   [3]
       $5x + 3y = 27$, $3x - 2z = -1$, $y + 2z = 14$

14. a) If $(a^2 + b^2) \sin(A - B) = (a^2 - b^2) \cdot \sin(A + B)$, prove that the triangle ABC is right angled isosceles triangle.   [2]
    b) Find the equation of the parabola whose focus is at the point $(2, 3)$ and the directrix is $3x + 4y - 5 = 0$.   [3]

15. a) A helicopter is flying horizontally at height of 7 km with a velocity of 360 km/hr. Find the rate at which it is receding from fixed point on the ground which it passed over 4 minutes ago.   [3]
    b) If $|\vec{p} + \vec{q}| = |\vec{p} - \vec{q}|$, then prove that $\vec{p}$ is perpendicular to $\vec{q}$.   [2]

16. 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 in-determinante form of function. [1]

    d) What does $\frac{\Delta y}{\Delta x}$ represent ? [1]

    e) Reduce the expression $\frac{3}{(x+4)(x-2)}$ into partial fraction. [1]

17. Raw materials used in production of a synthetic fiver 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 (x)	46	53	37	42	34	29	60
Moisture content (y)	12	14	11	13	10	8	17

    a) Find the coefficient correlation [2]

    b) Predict the moisture content when the relative humidity is 40 percent. [3]

18. a) Evaluate $\int \frac{SinA}{\sqrt{1+sinA}}\, dA$ [3]

    b) Solve : $\frac{dy}{dx} = e^{\,x-y} + x^3 . e^{-y}$ [2]

19. a) A Particle is projected with a velocity u . If the greatest height attained by the particle be H, prove that the range R on the horizontal plane through the point of projection is

    $R = 4\sqrt{H(\frac{u^2}{2g} - H)}$ [3]

    b) O is the orthocenter of triangle PQR. Forces X, Y, Z acting along OP, OQ, OR are in equilibrium. Prove $\frac{x}{QR} = \frac{Y}{PR} = \frac{Z}{PQ}$ [2]

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 $Z = 12x + 17y$ subject to
    $2x +3y \le 21 , 5x + 7y \le 50$ and x, y ≥ 0 [3]

GROUP C   [3 × 8=24]

20. a) From 8 gentlemen and 6 ladies a committee of 6 is to be formed. In how men ways can this be done so as to include at least 5 gentlemen. [3]

    b) Using principle of mathematical induction, show that :
    $1^2 + 2^2 + 3^2 + \dots,\dots + n^2 = \frac{n\,(n+1)(\,2n+1)}{6}$ [3]

    c) Apply De-Moivre's theorem to compute $(1+ i)^{10}$ [2]

21. a) Find the coordinate of the vertices and the foci of the ellipse
    $4x^2 + 9y^2 - 16x -18y -11 = 0$ [3]

    b) If $A =30^0, B = 45^0$ and $a = 6\sqrt{2}$ of a triangle ABC, find b and c. [2]

    c) Prove by vector method that : Sin (A- B) = sinA.cos B – cosA. sinB [3]

22. a) Write uses of L- Hosital's rule with an example. [2]

    b) Give an example of linear differential equation, homogenous differential equation and standard integral each. [3]

    c) Define improper faction . Find the derivative of Arc sinh (cosh x). [1+2]

THE END