HISSAN CENTRAL EXAMINATION - 2080 (2024)

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

Time : 3 hrs

COM. MATHEMATICS (0081 M1)

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 permutation of n thing taken r at time is …
   a) r^n b) n^{r-1} c) r^{n-1} d) n^r
2. In a matric equation A X = B , if $|A| = 0$ then the system has a
   a) trivial solution b) no solution
   c) infinitely many solutions d) unique solution
3. If b cosB = c cosC 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 $\frac{(x+h)^2}{a^2} + \frac{y^2}{b^2} = 1$, b> a then the foci is
   a) (h, $\pm be$) b) (h$\pm ae$, 0) c) (- h$\pm ae$, 0) d) (-h, $\pm be$)
5. ABCD is a parallelogram. Which one of the following represents area of the parallelogram?
   a) Magnitude of vector product of two vectors along AB and BD
   b) Magnitude of vector product of two vectors along AB and DC
   c) Magnitude of vector product of two vectors along AC and BC
   d) Magnitude of vector product of two vectors along AB and AD
6. a bag contains some tickets numbered from 1 to 15. Two ticket are drawn one by one without replacement. The probability that the first ticket has even number and second ticket the odd number is
   a) $\frac{1}{5}$ b) $\frac{4}{15}$ c) $\frac{3}{14}$ d) $\frac{7}{15}$
7. 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
8. Which one of following is equal to $\lim_{x\to 0}\frac{tanx-x}{x-sinx}$?
   a) 0 b) 1 c) 2 d) 3
9. Which one of following is the an approximate change in $\frac{1}{x}$ as x from 1 to o.98 ?
   a) 0.1 b) 0.2 c) 0.02 d) 0.002
10. The integrating factor of the differential equation $\cos^2 x\frac{dy}{dx} + y = 1$ is
    a. tan x b. $e^{\tan x}$ c. $\sec^2 x$ d.$e^{\sec x}$
11. 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,

    The maximum horizontal range when the velocity of projection is 28m/sec. (g= 9.8 m/s^2) is
    a) 80 m b) 56m c) 40m d) 28m

GROUP B [8 × 5=40]

12. If $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$ and $z2 = r2(\cos\theta_2 + i\sin\theta_2)$
    (a) What is the argument of $\frac{z_2}{z_1}$? [1]
    (b) What is the modulus of $\frac{z_2}{z_1}$?. [1]
    (c) What is the polar form of $\frac{z_2}{z_1}$?. [1]
    (d) Write the Euler's form of $\frac{z_2}{z_1}$. [1]
    (e) Write the application of De-moivre's theorem. [1]
13. (a) Find the value of $\frac{2}{3!} + \frac{2}{3!} + \frac{2}{3!}$ +…,…,… . to ∞ [2]
    (b) Solve the following system of equation by using Row equivalent matrix method [3]
    7x - 3y = -2 9x + 3z = 21, 4y = 3z
14. a) If 2 cosA. sinC = sin B, prove that the triangle ABC is an isosceles triangle. [2]
    b) Find the equation of the hyperbola whose vertex at the point (0, 8) and passing through the point $(4, 8\sqrt{2})$ [3]
15. a) Water flows into an inverted conical tank at the rate of 12cm^3/min.. When the depth of water is 12cm, how fast is the level of rising ? let the height of tank is 20 cm and the radius at the top is 15 cm. [3]

b) Find the angle between two vectors $\vec{i} + \vec{j} - 2\vec{k}$ and $2\vec{i} - \vec{j} - \vec{k}$ [2]

16. (a) Define L.Hospital's rule. [1]
    (b) Write the slope of normal to the curve $y = x^3 - 2x$ at the point (1, 2) [1]
    (c) Write the integral of $\int \frac{dx}{\sqrt{x^2 - a^2}}$ [1]
    (d) Write a first order and first degree differential linear equation [1]
    (e) What is derivative of $\sinh^{-1} x$ [1]

17. The following data gives the price in rupees (x) and demand in unit (y) of 6 days of a week is given as:

x	10	12	13	12	16	15
y	40	38	43	45	37	43

    a) Calculate the Pearson's coefficient of correlation [2]
    b) Predict the demand unit when the price is Rs 20. [3]

18. (a) Evaluate $\int \frac{dy}{2\,siny + 4\,cosy}$ [2]
    (b) Solve by separation of variables of the equation
    $(x^2 - yx^2)dy + (y^2 + x^2y^2)\,dx$ [3]

19. (a) From a point on the ground at distance ' s' from the foot the a vertical wall, a ball is thrown at an angle of 45^0 which just clear the top of the wall and afterwards strikes the ground at a distance 'd' on the other side. Prove that the height of the wall is $\frac{d.s}{d+s}$ [3]
    (b) A is any point in the plane of the triangle PQR; X,Y Z are the middle points of side QR, RP and PQ of the triangle PQR. Prove that the resultant of forces represented by AX, AY and ZA is AP. [2]

    Or

    (a) Solve the following system of equations by Gauss elimination method [2]
    3 x + 2y -13 =0, 6x +5 y =28
    (b) Using simplex method to maximize Z = 5x - 3y subject to
    $3x + 2y \leq 6$, $3y - x \geq -4$ and x, $y \geq 0$ [3]

GROUP C **[3 × 8=24]**

20. a) If $(1+x)^n = C_0 + C_1 x + C_2x^2 + \ldots \ldots + C_nx^n$, prove that
    $C_0 + 2C_1 + 3C_2 \ldots \ldots + (n+1)\,C_n = (n+2)\,2^{n-1}$ [3]
    b) Using principle of mathematical induction, show that:
    $1^3 + 2^3 + 3^3 + \ldots,\ldots + n^3 = \frac{[(n(n+1)]^2}{4}$ [3]
    c) How many arrangements can be made with letters of the word CORONA VIRUS ? In how many of them have vowels together ? [2]

21. a) Find the the equation of tangents to the parabola $y^2 = 16x$ makes angle of 45^0 with the straight line $3x - y + 5 = 0$ [3]
    b) If $A = 30^0$, $b = \sqrt{3}$ and $a = 1$ in a triangle ABC, identify the types of triangle. [2]
    c) Find the angle between the the two diagonal of cube by vector method [3]

22. a) Define proper rational and improper rational functions. Integrate the partial fraction $\int \frac{3x^2}{(x+2)(3x^2+1)}\,dx$ [1+2]
    b) Write any one homogeneous differential equation in x and y and solve it. [2]
    c) The concept of antiderivative is necessary for solving a differential equation. Justify this statement with example. [3]

THE END