HSC Mar 2011 : Mathematics Paper - I

Answer key / correct responses on:

DAY —— **06**   SEAT NUMBER

| 2011 | II | 28 | | 1100 | | **J - 525** | (E) |

MATHEMATICS & STATISTICS (88)
(COMMERCE) PAPER - I

Time : 2 Hrs.   (4 Pages)   Max. Marks : 40

Notes :   *(i)*   *All questions are compulsory.*

   (ii)   *Figures to the right indicate full marks.*

   (iii)   *Answer to every question must be written on a new page.*

Q.1. (A)   **Attempt any ONE of the following :**   [8]

   (i)   Construct the truth table for $(p \lor q) \to p$.   (2)

   (ii)   Find the dual of the following statements :

   (a) $(p \land \sim q) \lor p$

   (b) $(\sim p \lor q) \land \sim q$ (2)

   (B)   **Attempt any ONE of the following :**

   (i)   If $A = \begin{bmatrix} 2 & 5 \\ 6 & 4 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 1 \\ 2 & 6 \end{bmatrix}$

   then find : (a) $(A + B)$,   (b) $(B - A)$ (2)

   (ii)   If $A = \begin{bmatrix} 2 & 4 \\ -1 & -2 \end{bmatrix}$; then show that A^2 is a null matrix.   (2)

   (C)   **Attempt any ONE of the following :**

   (i)   Find the approximate value of $\sqrt{98}$.   (4)

| 0 | 5 | 2 | 5 |

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(ii) A manufacturer can sell x items at a price of ₹ $(330 - x)$ each. The cost of producing x items is $C = x^2 + 10x + 12$. Determine the number of items to be sold so that the manufacturer can make maximum profit. (4)

Q. 2. (A) Attempt any ONE of the following : [8]

(i) Using the truth table prove that

$(p \rightarrow q) \equiv (\sim q \rightarrow \sim p)$ (2)

(ii) Using the rules of negation, find the negation of the following statements :

(a) $(p \wedge q) \rightarrow p$

(b) $\sim p \longleftrightarrow \sim q$ (2)

(B) Attempt any ONE of the following :

(i) Differentiate $\log(1 + x^2)$ w. r. t. $\tan^{-1} x$. (2)

(ii) If $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, then find $\dfrac{dy}{dx}$. (2)

(C) Attempt any ONE of the following :

(i) Evaluate : $\displaystyle\int x^2 \tan^{-1} x \, dx$ (4)

(ii) Evaluate : $\displaystyle\int \dfrac{x^2 + 1}{(x^2 + 4)(x^2 + 9)} dx$ (4)

Q. 3. (A) Attempt any ONE of the following : [8]

(i) Evaluate : $\displaystyle\lim_{x \to \pi} \dfrac{\sin^2 x}{1 + \cos^3 x}$ (2)

(ii) If $f(x) = \dfrac{\sqrt{4 + x} - 2}{x}$, for $x \neq 0$

$= \dfrac{1}{4}$, for $x = 0$

Discuss the continuity of $f(x)$ at $x = 0$ (2)

0 5 2 5

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(B) Attempt any ONE of the following :

(i) If $y = (\tan x)^x$; find $\dfrac{dy}{dx}$ (2)

(ii) If $y = \log_a (\sin x)$; find $\dfrac{dy}{dx}$ (2)

(C) Attempt any ONE of the following :

(i) The rate of change of supply (S) w. r. t. price (P) is proportional to price P. If S = 35 when P = 2 and S = 60 when P = 3. Find the supply function. (4)

(ii) Solve the differential equation $(x+y)^2 \dfrac{dy}{dx} = 1$

by substituting $x + y = u$ (4)

Q. 4. (A) Attempt any ONE of the following : [8]

(i) Draw the Venn diagram to represent the truth of the following statements.

(a) All students are honest.

(b) Some lawyers are rich. (2)

(ii) Examine whether the following statement pattern is a tautology or a contradiction or a contingency.

$\sim (p \rightarrow q) \longleftrightarrow \sim p \vee q$ (2)

(B) Attempt any ONE of the following :

(i) Evaluate : $\displaystyle\int (\tan x + \cos x)^2 \, dx$ (2)

(ii) Evaluate : $\displaystyle\int \dfrac{x}{x-1} \, dx$ (2)

(C) Attempt any ONE of the following :

    (i)   Evaluate : $\lim\limits_{x \to 0} \dfrac{(5^x - 2^x)\, x}{\cos 3x - \cos 5x}$ (4)

    (ii) If $f(x) = \dfrac{\tan 2x}{3x} + a$, for $x < 0$

              $= 1$, for $x = 0$

              $= x + 4 - b$, for $x > 0$

      is continuous at $x = 0$, then find the values of a and b.   (4)

Q. 5. (A)   Attempt any ONE of the following :   **[8]**

    (i)   If $A = \begin{bmatrix} 6 & 3 \\ 4 & k \end{bmatrix}$ is a singular matrix, then find the value of k.   (2)

    (ii) If $A = \begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix}$, find the matrix $A^2 + 2A$.   (2)

(B)   Attempt any ONE of the following :

    (i)   Form the differential equation by eliminating the arbitrary

       constant 'a' from $y^2 = 4ax$ (2)

    (ii) Solve $2x + 3y^2 \dfrac{dy}{dx} = 0$ (2)

(C)   Attempt any ONE of the following :

    (i)   Evaluate : $\displaystyle\int_{2}^{3} \dfrac{\sqrt{5-x}}{\sqrt{x} + \sqrt{5-x}}\, dx$ (4)

    (ii) Evaluate : $\displaystyle\int_{0}^{\frac{\pi}{2}} \dfrac{dx}{5 - 4\cos x}$ (4)

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