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# HSC Mar 2011: Mathematics Paper - I

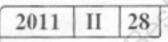
#### Answer key / correct responses on:

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1100

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(E)

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

Time: 2 Hrs.

(4 Pages)

Max. Marks: 40

Notes:

- 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.A. (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) (-p∨q)∧ 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.
- Attempt any ONE of the following :
  - (i) Find the approximate value of  $\sqrt{98}$ .

(4)

0 5 2 5

Page 1

P.T.O.

(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

 $(\mathbf{p} \to \mathbf{q}) \equiv (-\mathbf{q} \to -\mathbf{p}) \tag{2}$ 

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

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

(b) 
$$-p \longleftrightarrow -q$$
 (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  $\frac{dy}{dx}$ . (2)

(C) Attempt any ONE of the following:

- (i) Evaluate:  $\int x^2 \tan^{3x} x \, dx$  (4)
- (ii) Evaluate  $\int \frac{x^2 + 1}{(x^2 + 4)^2(x^2 + 9)} dx$  (4)

#### Q. 3. (A) Attempt any ONE of the following:

[8]

(2)

(2)

- (i) Evaluate:  $\lim_{x \to \pi} \frac{\sin^2 x}{1 + \cos^3 x}$
- (ii) If  $f(x) = \frac{\sqrt{4+x-2}}{x}$ , for  $x \neq 0$

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

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

# (B) Attempt any ONE of the following:

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

(2)

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

(2)

# (Ø) 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  $(x+y)^2 \frac{dy}{dx} = 1$ by substituting x + y = u (4)

## Q. 4. (A) Attempt any ONE of the following:

- [8]
- 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.

$$\sim (p \rightarrow q) \longleftrightarrow \sim p \lor q$$

(2)

# (B) Attempt any ONE of the following :

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

(2)

(ii) Evaluate: 
$$\int_{x-1}^{x} dx$$

(2)

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

(i) Evaluate: 
$$\lim_{x \to 0} \frac{(5^x - 2^x) x}{\cos 3x - \cos 5x}$$

(ii) If 
$$f(x) = \frac{\tan 2x}{3x} + a$$
, 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)

(2)

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

(i) Form the differential equation by eliminating the arbitrary constant 'a' from  $y^2 = 4ax$ 

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

# (C) Attempt any ONE of the following :

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

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

