

HIGHER SECONDARY EXAMINATION 2012

HSE (i)

Max : Marks 80

MATHEMATICS

Time 2½ Hours

Cool off time : 15 minutes

- I Let $A = \{x : x \text{ is an even natural number less than } 6\}$
 $B = \{x : x \text{ is a natural number which divides } 36\}$
Find a) Write A & B in roster form (1)
b) Find $A - B, A \cup B$ (1)
- II In a School there are 20 teacher who teach Mathematics or physic of these 10
teach mathematics, 6 teach both physics & mathematics. How many teach physics ?
How many teach physics only? (2)
- III Determine the domain and range of the relation R defined by
 $R = \{(x/x+5) : x \in \{0,1,2,3,4,5\}\}$ (2)
- IV Define modulus function : Draw the graph of
1) $|x-3|$ 2) $|x+2|$ (3)
- V Find the principal solution of $\sin x = -1/2$ & solve $2 \cos^2 x + 3 \sin x = 0$ (1+3)
- VI Prove that $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$
(3)
- VII If $\cos x = -1/2$, x lies in 3rd quadrant. Find the values of other 5 trigonometric functions (3)
- VIII Let $P(n) : 10^{2n-1} + 1$ is divisible by 11
1). Is $P(1)$ & $P(3)$ true (1)
2) If $P(k)$ is true verify $P(k+1)$ is true? (3)
- IX 1) Express $Z = \frac{-16}{1+i\sqrt{3}}$ in the form $a + ib$ (2)
2) Write modulus and amplitude of z (2)
3) Write z in polar form (1)

X 1) Solve $3(x-1) \leq 2(x-3)$ (1)

2) Solve the following system of inequalities graphically (3)

$$x+2y \leq 8, 2x+y \leq 8, x \geq 0, y \geq 0$$

XI 1) Find r if ${}^5P_r = 2 \times {}^6P_{r-1}$ (2)

2) Find the rank of the word FATHER, When the letter of the word are arranged as in a dictionary (3)

OR

1. Find n if $2n C_3 : n C_3 = 11:1$ (2)

2. A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 blacks and 3 red balls can be selected. (3)

XII. In the expansion of $(\frac{3}{2}x^2 - \frac{1}{3x})^6$
1) Write the general term (1)
2) Find the term independent of x (2)

XIII 1) If the sum of a certain number of terms of the AP 25,22,19..... is 116 find the last term (3)
2) If the 4th, 10th and 16th terms of a GP are x, y, z respectively. Prove that x, y, z are in GP

XIV i) Find the equation of the line perpendicular to the line $x-7y+5=0$ and having x intercept 3 (2)
ii) Find the co-ordinates of the foot of the perpendicular from the point $(-1,3)$ to the line $3x-4y-16=0$

XV i) Find the centre and radius of the circle $x^2+y^2-4x-8y-45=0$ (2)
ii) Find the co-ordinates of the foci, and the vertices, the eccentricity and length of latusrectum of the hyperbola $9y^2-4x^2=36$ (3)

XVI i) Find the ratio in which the yz plane divides the line segment formed by joining the point $(-2,4,7)$ and $(3,5,8)$ (2)
ii) The centroid of a triangle ABC is at the point $(1,1,1)$. If the Co-ordinates of A and B are $(3, -5,7)$ and $(-1,7,6)$ respectively; find the co-ordinates of the point C (2)

XVII i) Evaluate $\lim_{x \rightarrow 0} \frac{\cos 2x - 1}{\cos x - 1}$ (2)

ii) Evaluate $\lim_{x \rightarrow 2} \frac{3x^2 - x - 10}{x^2 - 4}$ (2)

XVIII i) Differentiate $\sec x$ from first principle (3)

OR

Differentiate $\frac{1}{x}$ from first principle

ii) Differentiate the following functions.

a) $\frac{1}{x^2} + 3x^{-4} + \frac{100}{x^3}$ (1)

b) $\frac{x \cos x}{x^3 + 3 \sin x}$ (2)

XIX 1) Write the contrapositive of the following statement
 "If a number is divisible by 9, then it is divisible by 3" (1)

2) Verify by the method of contradiction $P : \sqrt{7}$ is irrational (2)

XX Calculate the mean variance and standard deviation for the following data

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of Students	2	3	8	14	8	3	2

(4)

XXI i) If E and F are two events such that $P(E) = 0.05$, $P(F) = 0.10$ and $P(E \cap F) = 0.02$

Find $P(E \cup F)$ and $P(E' \cap F')$ (2)

ii) A card is selected from a pack of 52 cards calculate the probability that the card is

(a) An ace

(b) Black card (2)

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