

HIGHER SECONDARY MODEL EXAMINATION 2012
MATHEMATICS

HSE I

Max : Score 80

Time 2¹/₂ Hrs

1. Consider $U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$
 $A = \{x : x \text{ is a natural number and multiple of } 3 \text{ and less than } 10\}$
 $B = \{x : x \text{ is a natural number less than } 6\}$
 - 1) Represent A and B in the Roster form (1)
 - 2) Find A' and B' (1)
 - 3) Find $A \cup B$ and $A \cap B$ (1)
 - 4) Verify that $(A \cup B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$ (2)
2. Let $A = \{1, 2, 3, 4, 5, 6\}$ Define a relation R from A to A by
 $R = \{(x,y) : y = x+1\}$
 - 1) Depict this relation using an arrow diagram (1)
 - 2) Write down the domain, Co-domain and Range of R (3)
3. Consider the function $f(x) = 2x - x^2$ find the value of
 $f(0), f(-1), f(1)$ and $f(2)$ (2)
4. (1) Convert $10^\circ 30'$ into radian measure (1)
- (2) Prove that $\frac{\tan(\frac{\pi}{4}+x)}{\tan(\frac{\pi}{4}-x)} = \left(\frac{1+\tan x}{1-\tan x}\right)^2$ (3)
- (3) Find the general solution of the equation $\sin 2x + \cos x = 0$ (2)
5. Consider $p(n) = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$
 - 1) Prove that P (1) is true (1)
 - 2) Assuming that P(k) is true, prove that P(k+1) is true. Hence prove that P(n) is true for all natural numbers (3)
6. (1) Express i^{-39} in the form of $a + ib$ (1)
- (2) Represent the above complex number in the polar form (2)
- (3) Solve $\sqrt{2x^2 + x} + \sqrt{2} = 0$ (2)
7. (1) Solve the following system of inequalities graphically
 $3x+4y \leq 60, x + 3y \leq 30, x \geq 0, y \geq 0$ (3)
8. 1) Find the value of n, ${}^n P_4 : ({}^{n-1} P_4 = \frac{5}{3}, n > 4$ (2)
- 2) How many words can be made from the letters of the word HYPERBOLA,
 - a) If all the letters are used (2)
 - b) If vowels are all together (2)

OR

- (1) Determine n if ${}^{2n}C_3 : {}^nC_3 = 12 : 1$ (2)
- (2) A group consist of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has
- a) No girls (2)
- b) Exactly 2 girls (2)
9. Consider the expansion $(x - \frac{3}{x})^8$
- 1) Find the general term (2)
- 2) Find the term independent of x (2)
10. (1) Insert 5 numbers between 8 and 26 such that the resulting sequence is an A.P (2)
- (2) The sum of first three terms of a G.P is $\frac{39}{10}$ And their product is 1. Find the common ratio and the terms. (2)
- (3) Find the sum to n terms of the series whose n^{th} term is given by $n(n+1)(n+4)$ (2)
11. (1) Find the slope of the line passing through the points A (3, -2) and B(-1, 4) (1)
- (2) Write the equation of the above line (2)
- (3) Find the equation of perpendicular bisector of the line AB. (2)
- (4) Find the distance of the point (3, -5) from the line $3x - 4y - 26 = 0$ (2)
12. Consider the equation of the ellipse $\frac{x^2}{4} + \frac{y^2}{25} = 1$
- Find foci, vertices, eccentricity and length of Satus rectum (4)
13. (1) A point is in the YZ plane. What is its y co-ordinate. (1)
- (2) Name the octant in which the point (-4,2,-5) lie (1)
- (3) Show that the points(-2,3,5) (1,2,3) and (7,0,-1) are collinear (3)
14. (1) Evaluate $\lim_{x \rightarrow 3} \frac{x^2 - 27}{x^2 - 9}$ (2)
- (2) Find the derivate of $\tan x$ using first principle (3).
- (3) find the derivative of $(x+a)$ (1)

OR

- (1) Evaluate $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ (2)
- (2) Find the derivative of $\sin x \cos x$ (2)
- (3) Find the derivative of $\frac{1}{x}$ using first principle (2)
- 15.(1) Write the negation of the statement. "For every real number x , x is less than $x+1$ " (1)
- (2) Prove by contradiction method that " $\sqrt{5}$ is irrational" (3)

- 16 The diameters of circles (in mm) drawn in a design are given below
- | | | | | | |
|----------------|---------|-------|-------|-------|-------|
| Diameters | : 33-36 | 37-40 | 41-44 | 45-48 | 49-52 |
| No.of circles: | 15 | 17 | 21 | 22 | 25 |
- (1) Find the mean diameter (2)
- (2) Calculate the standard deviation (3)
17. (1) Given $P(A) = \frac{3}{5}$ and $p(B) = \frac{1}{5}$.Find $P(A \text{ or } B)$ if A& B are mutually exclusive. (2)
- (2) A card is selected from a pack of 52 cards calculate the probability That
- (a) The card is an ace (1)
- (b) The card is black (1)
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