

FIRST YEAR HIGHER SECONDARY MODEL EXAMINATION
FEBRUARY 2012
PART III MATHEMATICS

Score : 80

General Instructions to Candidates

- ∅ **There is a Cool off time of 15 minutes in addition to 2½ hours**
- ∅ **You are not allowed to write your answers or to discuss anything with others during cool off time**
- ∅ **Use cool off time to get familiar with questions and to plan your answers**
- ∅ **All questions are compulsory and only internal choice is allowed**
- ∅ **When you select a question , all sub-questions must be answered from the same question itself**

1. If $U = \{-2, -1, 0, \dots, 7\}$

$A = \{x/x \text{ is an integer and } -3 < x < 7\}$

$B = \{x/x \text{ is a natural number less than } 6\}$

(a) Write A and B in the Roster form (1)

(b) Find $A \cap B$, $A \cup B$, $A \setminus B$ and $B \setminus A$ (2)

(c) Verify $(A \cap B) \cup (A \setminus B) = A$ (2)

2. (a) Draw the graph of the function (2)

$$f(x) = \frac{x^2 - 1}{x}, x \neq 0$$

$$= 0, x = 0$$

(b) Write the domain and range of the function (2)

3. (a) Find the value of $\sin\left(-\frac{11\pi}{3}\right)$ (1)

(b) If $\sin x = \frac{3}{5}$, $\cos y = -\frac{12}{13}$ where x and y lie in the second quadrant, find the value of $\sin(x + y)$. (3)

4. (a) Show that $\tan 3x \cdot \tan 2x \cdot \tan x = \tan 3x - \tan 2x - \tan x$ (2)

(b) Find the general solution of the equation $\sin 2x + \cos x = 0$ (2)

5. Let $P(n) : 7^n - 3^n$ is divisibly by n for every positive integer n

(a) Prove that $P(1)$ is true (1)

(b) Write $P(k)$ (1)

(c) Using $P(k)$, prove that $P(k+1)$ is true by using Mathematical Induction (2)

6. If $Z = \frac{1}{1+i}$
- (a) Express Z in $a + ib$ form (1)
- (b) Convert Z in polar form (2)
- (c) Solve $\sqrt{5x^2 + x} + \sqrt{5} = 0$ (2)
- 7 (a). Solve $-5 \leq \frac{5-3x}{2} \leq 8$ (2)
- (b) Solve graphically
- $$3x+4y \leq 60$$
- $$x+3y \leq 30$$
- $$x, y \geq 0$$
- (3)
8. (a) Find the value of 'n' such that $nP_5 = 42 nP_3$, $n > 4$ (2)
- (b) How many chords can be drawn through 21 points on a circle (2)
- (c) In how many ways 5 girls and 3 boys be selected in a row so that no two boys are together (2)

OR

9. (a) Determine 'n' if $2nC_3 : nC_3 = 12 : 1$ (2)
- (b) How many 4 digit numbers are there with no digit repeated (2)
- (c) In how many of the distinct permutations of letters in 'MISSISSIPPI' do the four I's not come together (2)
10. (a) Find the coefficient of x^6y^3 in the expansion of $(x + 2y)^9$ (2)
- (b) Find the term independent of x in the expansion of $(\frac{3}{2}x^2 - \frac{1}{3x})^6$ (2)
11. (a) In an AP if the m^{th} term is 'n' and n^{th} term is m where $m \neq n$ find the p^{th} term (2)
- (b) The fourth term of a GP is square of its second term and the first term is -3. Determine its seventh term (2)
- (c) Find the sum to n terms whose n^{th} term is $(2n-1)^2$ (2)
12. (a) Find the value of x for which the points $(x,-1), (2,1)$ and $(4,5)$ are collinear (2)
- (b) Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$ (2)
- (c) Find the equation of the line perpendicular to the line $x - 7y + 5 = 0$ and having x intercept 3 (2)
13. (a) Find the centre and radius of the circle $x^2 + y^2 - 8x + 10y - 12 = 0$ (2)
- (b) Find the coordinates of the foci, vertices, eccentricity and the length of the latus rectum of conic $4x^2 + 9y^2 = 36$ (2)
14. (a) Verify $(0,7,-10), (1,6,-6)$ and $(4,9,-6)$ are the vertices of an isosceles triangle (2)

(b) Find the ratio in which YZ plane divides the line segment formed by the points $(-2,4,7)$ and $(3,-5,8)$ (2)

15. (a) $\lim_{x \rightarrow \pi} (x - \frac{22}{7}) = \dots\dots\dots$ (1)

(b) Evaluate $\lim_{x \rightarrow 0} (\frac{\sin ax}{\sin bx})$, $a, b \neq 0$ (2)

(c) Find the derivative of $\cos x$ using first principle (3)

16. (a) Write the negation of the statement “ Every natural number is an integer” (1)

(b) Verify by the method of contradiction that “ $\sqrt{7}$ is irrational” (3)

17. Calculate Mean, Variance and Standard deviation for the following distribution (5)

Classes	30-40	40-50	50-60	60-70	70—80	80-90	90-100
Frequency	3	7	12	15	8	3	2

18. If A and B are events such that $P(A) = 0.42$ $P(B) = 0.48$ and $P(A \text{ and } B) = 0.16$.

Determine

(a) $P(\text{not } A)$

(b) $P(\text{not } B)$

(c) $P(A \text{ or } B)$

(d) $P(\text{not } A \text{ and not } B)$ (4)

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