First Year Higher Secondary Model Examination
Part III

HSE – 1

MATHEMATICS (SCIENCE)

Time : $2^1/_2$ hrs
Score : 80
Cool off time : 15 mts

Instructions

- There is a 'Cool off time' of 15 minutes in addition to the writing time of $2^1/_2$ hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool off time'.
- Use the 'cool off time' to get familiar with questions and to plan your answers.
- Read questions carefully before Reading
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question it self
- Calculations, Figures and graphs should be shown in the answer sheet itself.
- Give equations wherever necessary.

1. Let A = The set of Letters in the word 'BETTER' and
   B = The set of letters in the word 'VELVET'

(a) Write A and B in roster form

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

(c) Show that $A \cup B = (A-B) \cup (B-A) \cup (A \cap B)$

(1+2+1 = 4)

2 (a) Find the domain and range of the function 'f' defined by f(x) = /x-1/

(b) Draw the rough sketch of the graph of the above function (3+2 = 5)

3 (a) Prove that $\text{Cot}(x + y) = \frac{Cot\ x \cot y + 1}{Cot\ y - Cot\ x}$

(b) Find the value of $\sin 18^o$

(c) Prove that $\frac{Sin\ 5x - 2\ Sin\ 3x + Sin\ x}{Cos\ 5x - Cos\ x} = \tan x$

(d) Solve $2Cos^2x + 3\,Sin\,x = 0$ (2+2+2+2 = 8)

4. Let P(n) be the statement $P\,(n) = 1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n\,(n+1)(2n+1)}{6}$

(a) Is P(1) true ? Justify

(b) Show that P (k+1) is true whenever P(k) is true.

(1+ 3 = 4)

5. Consider the complex number $z = \frac{1}{1+i}$

(a) Express Z in a + ib form

(b) Find the conjugate of z

(c) Express z in Polar form

(2+1+3 = 4)

6 (a) Solve $5x - 3 \geq 7$

(b) solve the system of inequalities graphically

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

(1+ 4 = 5)

7 (a) Find the number of arrangements of the letters of the word 'MATHEMATICS'

(b) Find the number of words in which the vowels together (2+2 = 4)

OR

8. A group consist of 4 girls and 7 boys. How many ways can a team of 5 members be selected if the team has (2+2 = 4)

(a) no girls

(b) At least 3 Girls

9 (a) find the general terms in the expansion of $(\frac{5}{2}x^2 - \frac{1}{5x})^6$

(b) Find the term independent of x in the expansion of $(\frac{5x^2}{2} - \frac{1}{5x})^6$ (1+2 = 3)

10

(a) Find the sum of the sequence 7 + 77 + 777+ …….n terms

(b) If p^{th}, q^{th}, r^{th} and s^{th} terms of an A.P. are in G.P. then show that p-q, q-r, r-s are in G.P.

(2+3 = 5)

11.

(a) The equation of the x axis is _____

(b) Reduce to intercept form and find x and y intercepts of 3x+2y – 12 = 0

(c) Find the perpendicular distance between the parallel lines 15x + 8y – 34 = 0 and 15 x + 8y – 31 = 0

(1+2+2 = 5)

12.

(a) Find the equation of the ellipse whose center at (0,0), major axix on the y axis and passing through (3, 2) and (1,6)

(b) Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre is on the line 4 x + y – 16 =0

13. Find the equation of the set of points which is equidistant from the points (1,2,3) and (3,2,-1)

(2+2+2 = 6)

14. Find

(a) $\underset{x \to o}{Lt} \frac{(1+x)^n - 1}{x}$

(b) $\underset{x \to o}{Lt} \frac{1 - Cos\, x}{x}$

(c) $\underset{x \to o}{Lt} \frac{Sin\, 5x}{Sin\, 3\, x}$

(d) $\underset{x \to 2}{Lt} \frac{x^n - 2^n}{x-2}$

(1+1+1+1 = 4)

15.

(a) Find the derivate of tanx or sinx from first principle

(b) Find the derivative of

(i) (x – a) (x – b)

(ii) $x^2 + 3\, x + 5\, Sinx$

(iii) $\frac{Cos\, x}{1+Sinx}$ (2+1+1+2 = 6)

16.

(a) Write the negation of the statement the number 2 is greater than 7

(b) For the given statement identify the necessary and sufficient condition “If you drive over 82 km per hour, then you will get a train

(1+2 = 3)

17. Consider the following data

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	7	15	15	4	2

(a) Find the arithmetic mean

(b) Standard deviation

(c) The coefficient of variation (1+3+1 = 5)

18.

(a) Describe the sample space for the experiment ‘a coin is tossed three times’

(b) Find the probability of getting

(i) Exactly two heads

(ii) Al least two heads

(1+3= 4)