

# FIRST YEAR HIGHER SECONDARY MODEL EXAMINATION MATHEMATICS(SCIENCE)

Time :  $2\frac{1}{2}$  hours

Cool-off Time : 15 minutes

Maximum Score: 80

General Instructions to Candidates

- There is a 'cool-off time' of 15 minutes in addition to the writing time of  $2\frac{1}{2}$  hours.
- 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 answering.
- 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 itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

1.  $A = \{ x : x \text{ is a prime number, } x < 10 \}$   
 $B = \{ y : y \text{ is a factor of } 6 \}$ 
  - a) Write A and B in roster form 2
  - b) find  $A \cup B$  and  $A \cap B$  2
  - c) Find a universal set for the given sets. 1
2. Consider  $f(x) = \sqrt{x-2}$ ,  $g(x) = \frac{x+1}{x^2-2x+1}$ 
  - a) Find the domains of f and g 2
  - b) Find  $(f+g)(x)$  and  $(fg)(x)$  2
3.
  - a) show that  $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0$  3
  - b) If  $x + y = \frac{\pi}{4}$  prove that  $(1 + \tan x)(1 + \tan y) = 2$  3
  - c) Convert  $\frac{31\pi}{3}$  radian into degree measure 2

OR

- a) Prove that  $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$  4
- b) Find the principal and general solutions of  $\cos x = \frac{-\sqrt{3}}{2}$  2
- c) If  $\cos x = \frac{-1}{2}$ ,  $x$  is in  $3^{rd}$  quadrant, find  $\sin x$  and  $\tan x$  2
4. Consider the statement  $P(n) : 2^{3n} - 1$  is divisible by 7
- a) Find  $P(1)$  1
- b) Assuming  $P(k)$  is true prove that  $P(k + 1)$  is true 3
5. a) Express  $z = \frac{2-i}{(1-i)(1+2i)}$  in the form  $a + ib$  2
- b) Write the conjugate of  $z$  1
- c) Represent  $z = \sqrt{3} + i$  in polar form 2
6. a) Solve  $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$  2
- b) Solve the following system of inequalities graphically 3
- $$\begin{aligned} x + 2y &\leq 8 \\ 2x + y &\leq 8 \\ x, y &\geq 0 \end{aligned}$$
7. a) Find  $r$  if  $5P_r = 6P_{r-1}$  2
- b) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls? 2
- c) Find the number of words that can be formed from letters of the word MALAYALAM 2
8. a) Find the general term of  $(\frac{x}{2} + \frac{2}{x})^8$  1
- b) Find the term independent of  $x$  in the above expansion. 2
- c) Which term is the middle term of the expansion. 1
9. a) If the  $n^{th}$  term of a sequence is  $a_n = \frac{n(n^2+5)}{5}$  find  $a_5$  1
- b) Find the sum of all numbers between 200 and 400 which are divisible by 7 2
- c) Find the sum to  $n$  terms of the sequence 8, 88, 888, ..... 3
10. a) Find the slope of the line passing through the points  $(2, -1)$  and  $(4, -3)$ . 1
- b) Find the angle between the above line and the  $x$ -axis. 2
- c) Find the image of the point  $(3, 8)$  with respect to the line  $x + 3y = 7$  3
11. Consider the ellipse  $36x^2 + 4y^2 = 144$
- a) Express the given ellipse in standard form. 1
- b) Find the eccentricity, focus, major axis, minor axis and the length of latus rectum. 3

12. a) Find the ratio in which the line segment joining  $(-2, 4, 7)$  and  $(3, -5, 8)$  is divided by the  $YZ$  plane. 2  
 b) If the origin is the centroid of the triangle  $PQR$  with vertices  $P(2a, 2, 6)$ ,  $Q(-4, 3b, -10)$  and  $R(8, 14, 2c)$  then find the values of  $a, b, c$  2
13. a) Evaluate  $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 - 4}$  2  
 b) Find the derivative of  $\frac{\cos x}{1 + \sin x}$  3

OR

- a) Evaluate  $\lim_{x \rightarrow \pi} \frac{\sin(\pi - x)}{\pi(\pi - x)}$  1  
 b) Using the first principle find the derivative of  $\tan x$  4
14. a) Write the negation of "Both the diagonals of a rectangle have the same length" 1  
 b) verify by the method of contradiction  $\sqrt{2}$  is irrational 3
15. For the frequency distribution
- |           |      |       |       |       |       |
|-----------|------|-------|-------|-------|-------|
| Class     | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
| Frequency | 5    | 8     | 15    | 16    | 6     |
- a) Find mean 2  
 b) Calculate the variance 3
16. a) A card is drawn from a well shuffled pack of 52 cards. Calculate the probability that the card will be a diamond 2  
 b)  $P(A) = \frac{1}{4}, P(B) = \frac{1}{2}, P(A \cup B) = \frac{1}{8}$  then find  $P(A \text{ or } B)$  and  $P(\text{not } A \text{ and not } B)$  3

**Prepared by Kollengode Subdistrict, Palakkad**

**Geetha V.P, BSSHSS Kollengode**

**Praseetha V, VMHSS Vadavannur**

**Hemambika M, GBHSS Nemmara**

**Princy C, GGVHSS Nemmara**

**Lakshmidevi A V, GBHSS Nemmara**

**Deepa S, GHSS Muthalamada**

**Baby Prasanna M, GHSS Muthalamada**