

# FIRST YEAR HIGHER SECONDARY MODEL EXAMINATION MATHEMATICS(SCIENCE)

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

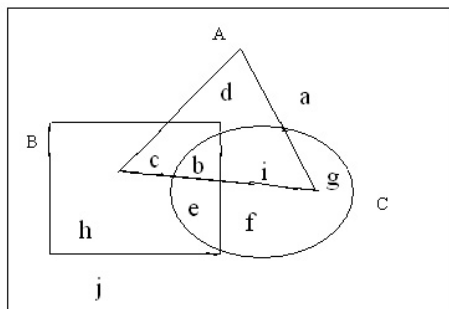
Maximum Score: 80

Cool-off Time : 15 minutes

## 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. Consider the following Venn diagram



Let the triangle represent Set A, the square represent Set B and the circle represent Set C

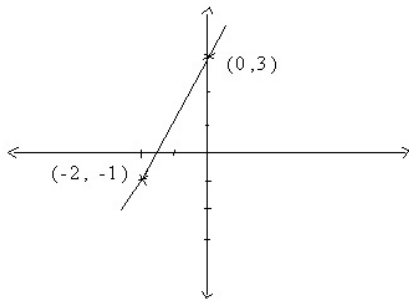
- a) Write the sets A, B, C in roster form 1
- b) The set of elements belonging to A and C but not B is ..... 1

- c) Find  $(A \cup B)'$  1  
d) Verify the formula  $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$  2
2. a) Find  $x$  and  $y$  if  $(\frac{x}{2} + 1, 5) = (\frac{5}{2}, 2y + 1)$  1  
b) Let  $A = \{1, 2, \dots, 15\}$ . A relation  $R$  on  $A$  defined by  $R = \{(x, y) : y = x^2 + 1, x, y \in A\}$   
i) Write this relation in Rosterform  
ii) Write the domain and range 2
3. a) Let  $f$  and  $g$  be two real valued functions on  $R$  defined by  $f(x) = x^2 + 1$  and  $g(x) = x - 1$   
find  $(f + g)(x)$  and  $(fg)(x)$  1  
b) Define modulus function and draw its graph 2
4. a) Convert  $60^\circ$  into radian measure 1  
b) Find the radius of the circle in which a central angle of  $60^\circ$  intercept an arc of length 37.4 cm (use  $\pi = \frac{22}{7}$ ) 2
5. a) Write the principal values of  $\sin x = \frac{-1}{2}$  1  
b) Solve  $2\cos^2 x + 3\sin x = 0$  2
6. Let  $P(n)$  be the statement  $7^n - 3^n$  is divisible by 4, for every  $n \in N$   
a) Prove that  $P(1)$  is true 1  
b) Prove that  $P(n)$  is true for  $n > 1$ , by using mathematical indication 3
7. Find two roots  $z_1$  and  $z_2$  of the equation  
a)  $z^2 - 2\sqrt{3}z + 4 = 0$  1  
b) If  $z = \frac{z_1}{z_2}$ , write  $z$  in  $a + ib$  form 2  
c) Express  $z$  in polar form 2
8. a) Solve  $\frac{2x-1}{3} \geq \frac{3x-2}{4} - \frac{2-x}{5}$  2  
b) Solve the following system of inequalities graphically  $x \geq 0$  ;  $y \geq 0$  ;  $x + 2y \leq 8$  ;  $2x + y \leq 8$  3
9. a) The number of permutations of  $n$  different objects taken  $r$  at a time, where repetition is allowed is ..... 1  
b) Find the number of 3-letter words which can be formed by the letters of the word NUMBER where repetition is allowed 1  
c) Find  $n$  if  $\frac{nP_4}{n-1P_4} = \frac{5}{3}$  ;  $n > 4$  2  
d) How many words, with or without meaning can be formed using all the letters of the word EQUATION using each letter exactly once? 2

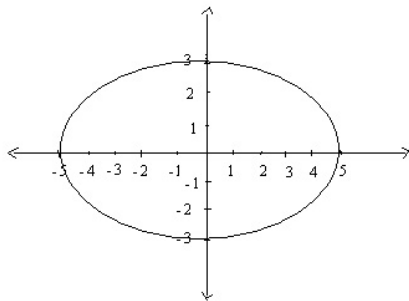
OR

- a)  $nC_r(n - r) = \dots\dots\dots$  1  
b) If  $nC_9 = nC_8$ , find  $nC_{17}$  2  
c) Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in a dictionary, what will be the 50<sup>th</sup> word ? 3

10. Consider the expansion of  $(\frac{x^2}{3} - \frac{1}{5x})^6$
- a) Write the general term and middle term in the above expansion 2
- b) Which is the term independent of x in the above expansion? 2
11. a) Find geometric mean between the numbers 4 and 9 1
- b) How many terms of the A.P  $-8, \frac{-15}{2}, -7, \dots$  are indeed to give the sum -63 2
- c) Find the sum to n terms of the series  $0.7 + 0.77 + 0.777 + \dots$  3
12. consider the following graph



- a) Find the equation of the above line 1
- b) Write this equation in slope intercept form and find its X-intercept 2
13. Find the equation of the line perpendicular to the line  $x - 7y + 5 = 0$  and having y intercept 4 3
14. Consider the following figure



- a) Write the equation of the conic 1
- b) Find the co-ordinates of the focus 1
- c) Find the eccentricity 1
- d) Find the length of latus rectum 1

15. a) Name the octant in which the point  $(-4, 2, -5)$  lie 1  
 b) Find the distance between the pair of points  $(-1, 3, -4)$  and  $(1, -3, 4)$  1  
 c) Find the ratio in which YZ-plane divides the line segment joining the points  $(-2, 4, 7)$  and  $(3, -5, 8)$  2
16. a)  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = \dots\dots\dots$  1  
 b) Find  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x}-1}{x}$  2
17. Find the derivative of  $\tan x$  from first principles 3

OR

compute the derivatives of the following using appropriate rules

- a)  $(x - 2)(x - 3)$   
 b)  $\frac{x-2}{x-3}$  3
18. a) Write the negation of the following statement " Both the diagonals of a rectangle have the same length" 1  
 b) By the method of contradiction, prove that ' $\sqrt{11}$  is irrational' 3
19. The following values are calculated with respect to the heights and weights of the students of a section of class XI
- |          | Height                | Weight                |
|----------|-----------------------|-----------------------|
| Mean     | 162.6cm               | 52.36kg               |
| Variance | 127.69cm <sup>2</sup> | 23.136kg <sup>2</sup> |
- a) Calculate the coefficient of variation for height 2  
 b) Calculate the coefficient of variation for weight 2  
 c) Which is more variable? 1
20. a) If A and B are mutually exclusive, then  $P(A \text{ or } B) = \dots\dots\dots$  1  
 b) A coin is tossed twice. If the second throw results in a head, a die is thrown.  
 i) Write the sample space of the above experiment 1  
 ii) What is the probability of getting a head and an even number? 2

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