Reg. No. : .....

Name : .....

FME-27

FIRST YEAR HIGHER SECONDARY MODEL EXAMINATION, FEBRUARY 2020

Part – III

Time : 2 Hours

MATHEMATICS (SCIENCE)

Cool-off time : 15 Minutes

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'Cool-off time' of 15 minutes in addition to the writing time.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Answer any 6 questions from 1 to 8. Each carries 3 scores. **(6 × 3 = 18)**

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

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

   (i) Express A and B in roster form. **1**

   (ii) Find A – B, B – A. **1**

   (iii) Prove that $(A - B) \cup (B - A) = A - B$. **1**

2. In a class of 35 students, 24 likes to play cricket, 16 like to play football. Also each student like to play atleast one of the two games. How many likes to play both cricket and football ? **3**

3. (i) $\sin 315° =$ _____ **1**

   (A) $\frac{-1}{2}$ (B) $\frac{-1}{\sqrt{2}}$

   (C) $\frac{\sqrt{3}}{2}$ (D) 1

   (ii) Prove that $2\sin^2\frac{\pi}{6} + \text{cosec}^2\frac{7\pi}{6}\cos^2\frac{\pi}{3} = \frac{3}{2}$. **2**

4. If the sum of first n terms of an arithmetic progression 2, 5, 8 ..... is equal to the sum of first n terms of another arithmetic progression 57, 59, 61 ..... Then find the value of n. **3**

5. The sum of first three terms of a geometric progression is $\frac{13}{12}$ and their product is –1.

   (i) Find common ratio. **2**

   (ii) Find geometric progression. **1**

6. (i) Find the ratio in which the line segment joining the points (2, 4, –3) and (–3, 5, 4) is divided by XY plane. 2

(ii) Hence find the coordinate of the point. 1

7. Find derivative of cos x from first principle. 3

8. Find the derivative of $\frac{\cos x}{1 + \sin x}$ with respect to x. 3

Answer any 6 questions from 9 to 16. Each carries 4 scores. **(6 × 4 = 24)**

9.

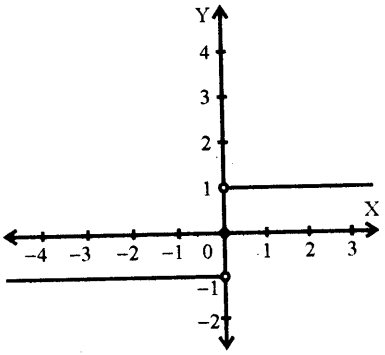


Fig. – 1

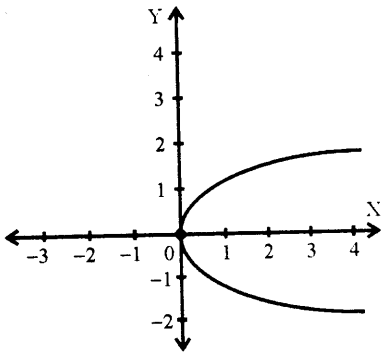


Fig. – 2

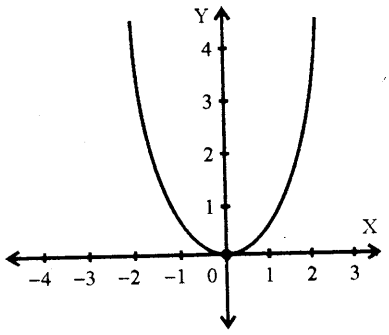


Fig. – 3

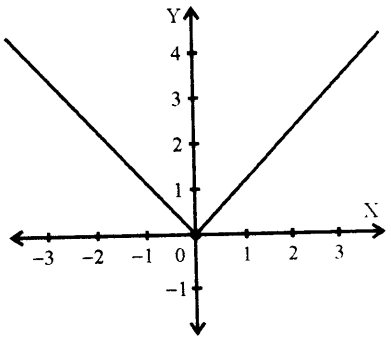


Fig. – 4

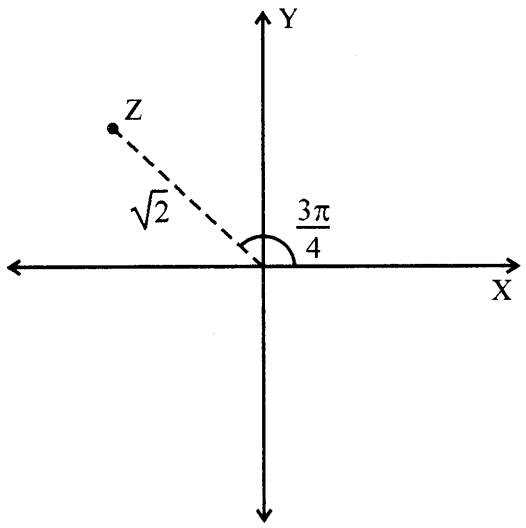
(i) Which of the above graph doesn't represent a function ? 1

(ii) Identify signum function from above graphs. 1

(iii) Write domain and range of signum function. 2

10. Prove using principle of Mathematical induction $7^n - 3^n$ is divisible by 4. **4**

11.



In the above figure, Z represents a complex number.

(i) Write the complex number in polar form. **1**

(ii) Find real and imaginary parts of Z. **1**

(iii) Find the multiplicative inverse of Z in the form a + ib. **2**

12. Solve the following system of inequalities graphically : **4**

$$2x + y \geq 4$$

$$x + y \leq 3$$

$$2x - 3y \leq 6$$

13. Find the middle term in the expansion of $\left(3 - \frac{x^3}{6}\right)^8$ **4**

14. (i) Find the area of a triangle formed by the line joining the vertex of parabola $y^2 = 12x$ to the two ends of its latus rectum. **2**

(ii) Hence find equation of a circle with centre at focus of the above parabola and diameter as latus rectum of parabola. **2**

15. (i) Write the negation of the statement "All triangles are not equilateral triangle". **1**

(ii) Prove by the method of contradiction $\sqrt{7}$ is irrational. **3**

16. Find the probability that when a hand of 7 card is drawn from a well shuffled deck of 52 cards, it contains.

(i) all kings **2**

(ii) 3 kings **2**

Answer any 3 questions from 17 to 20. Each carries 6 scores. **(3 × 6 = 18)**

17. (i) Solve $\sin 2x - \sin 4x + \sin 6x = 0$. **4**

(ii) For any triangle ABC, prove that

$$\frac{a+b}{c} = \frac{\cos\left(\frac{A-B}{2}\right)}{\sin\frac{C}{2}}.$$ **2**

18. (i) If ${}^{n}C_9 = {}^{n}C_8$, n = _____

(a) 17 (b) 12

(c) 13 (d) 14 **1**

(ii) In how many way can the letters of the word PERMUTATIONS be arranged.

(a) Words start with P and end with S. **1**

(b) Vowels are all together. **1**

(iii) How many words with or without meaning each of three vowels and two consonants can be formed from the letters of the word INVOLUTE. **3**

19. (i) Find the equation of a line passing through the point (3, 8) and perpendicular to $x + 3y - 7 = 0$. **2**

(ii) Also find the image of the given point with respect to the line $x + 3y - 7 = 0$. **3**

(iii) Find the perpendicular distance from (3, 8) to the line $x + 3y - 7 = 0$. **1**

20. The following is the record of goals scored by team A in a football session.

No. of goals scored	0	1	2	3	4
No. of Matches	1	9	7	5	3

(i) Calculate the mean of team A. **1**

(ii) Calculate standard deviation of team A. **3**

(iii) For the team B, mean number of goals scored per match was 2 with a standard deviation 1.25 goals.

Find which team may be consider more consistent using coefficient of variation. **2**
