

INDIAN SCHOOL SOHAR
FINAL EXAMINATION– 2017
SUBJECT: MATHEMATICS

STD: XI
DATE: 2. 3 .17

MARKS: 100
TIME: 3Hrs

General Instructions:

- (i) All questions are compulsory.
- (ii) This question paper contains 29 questions.
- (iii) Question 1- 4 in Section A are very short-answer type questions carrying 1 mark each.
- (iv) Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
- (v) Question 13-23 in Section C are long-answer-I type questions carrying 4 marks each.
- (vi) Question 24-29 in Section D are long-answer-II type questions carrying 6 marks each.

SECTION – A

Questions 1 to 4 carry 1 mark each

1. Find the middle term in the expansion of $(a^3 + ba)^{28}$
2. Write the contrapositive and converse of the following statement:
“ If x and y are negative integers, then xy is positive”.
3. Find the slope of a line which cuts off intercepts of equal length on the axis.
4. Write the set $A = \{ a / a^3 = a, a \in R \}$ in the roster form.

SECTION – B

Questions 5 to 12 carry 2 marks each.

5. Evaluate: $\tan 720^\circ - \cos 270^\circ - \sin 150^\circ \cos 120^\circ$
6. Let $A = \{1,2,3,\dots,14,15\}$. Define a relation R from A to A by $R = \{(x,y) / 4x-y = 0, \text{ where } x,y \in A\}$. Write R in roster form and write its domain, range and co-domain.
7. Identify the quantifier in the following statement and write the negation of the statement:
“For every real number x, x is less than x+1”
8. 5 boys and 5 girls sit in a row at random. Find the probability that 5 girls sit together.
9. We wish to select 7 person from 9 but, if the person A is choosen, then B must be choosen.
In how many ways can selections be made?
10. Evaluate the following limit : $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$

11. Find the coordinate of foot of perpendicular drawn from the point P (3,4,5) on y- axis. Also find the length of the perpendicular.
12. The third term of GP is 4. Find the value of product of its first 5 terms.

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. Two students Rita and Mohan appeared in an examination. The probability that Rita will qualify the examination is 0.08 and that Mohan will qualify the examination is 0.10. The probability that both will qualify the examination is 0.05. Find the probability that
- (a) Both Rita and Mohan will not qualify the examination.
 (b) Only one of them will qualify the examination
14. Find the derivative of $\cos^2 x$ by using the first principle.
15. show that: $\tan(x-y) + \tan(y-z) + \tan(z-x) = \tan(x-y) \tan(y-z) \tan(z-x)$
16. Find the general solution for the following equation: $\cot \theta + \tan \theta = 2 \operatorname{cosec} \theta$
17. Prove the following by using the principle of mathematical induction for all $n \in N$:

$$10^n + 3(4^{n+2}) + 5 \text{ is divisible by } 9.$$

OR

$$1 + 2 + 3 + \dots + n < \frac{1}{8} (2n + 1)^2$$

18. Find the square root of the following complex numbers: $z = \frac{-16}{1+i\sqrt{3}}$

OR

If $z \in C$ and $|z| = 1$, then prove that $\frac{z-1}{z+1}$ purely imaginary.

19. Find the sum of the following series up to n terms: $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \dots$

20. Find the domain and range of the function $f(x) = \frac{5}{3-x^2}$

21. A boy has 3 library tickets and 8 books of his interest in the library. Of these 8, he does not want to borrow Mathematics Part II, unless Mathematics Part I is also borrowed. In how many ways can he choose the three books to be borrowed?

OR

Eighteen guests are to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on other side of the table. Find the number of ways in which the seating arrangements can be made.

22. Find the image of the point P(-8,12) with respect to the line mirror $4x + 7y + 13 = 0$
23. If there are $(2n + 1)$ terms in an A.P., then prove that the ratio of the sum of odd terms and the sum of even terms is $(n + 1) : n$

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. From 50 students taking examinations in Mathematics, Physics and Chemistry, each of the student has passed in at least one of the subject, 37 passed Mathematics, 24 Physics and 43 Chemistry. Atmost 19 passed Mathematics and Physics, atmost 29 Mathematics and Chemistry and 20 Physics and Chemistry. What is the largest possible number that could have passed all three examinations? Mention any two practices that the students must follow to improve their performance in examinations.

25. If $a \cos 2\theta + b \sin 2\theta = c$ has α and β as its roots, then prove that $\tan \alpha + \tan \beta = \frac{2b}{a+c}$

OR

If α and β are the solutions of the equation $a \tan \theta + b \sec \theta = c$, then show that

$$\tan (\alpha + \beta) = \frac{2ac}{a^2 - c^2}$$

26. Calculate Standard Deviation for the following distribution.

Classes	0 - 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 - 80
Frequency	5	8	7	12	28	20	10	10

27. Solve the following system of inequalities graphically:

$$2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6, x \geq 0, y \geq 0$$

28. a) A beam is supported at its ends by supports which are 12 metres apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 1 cm?

b) Find the equation of the parabola with focus (2,0) and directrix $x = - 2$.

OR

a) A rod of length 15 cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod, which is 6 cm from the end in contact with the x -axis.

b) Find the equation of the ellipse, whose length of the major axis is 20 and foci are $(0, \pm 5)$.

29. The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080, respectively. Find x , a and n .