Roll No.

Total No. of Questions–35] [Total No. of Printed Pages–16

M–357–XI–2324

MATHEMATICS

Time Allowed—3 Hours Maximum Marks—80

Candidates are required to give their answers in their own words as far as practicable.

Marks allotted to each question are indicated against it.

(i) While answering your Questions, you mu indicate on your Answer-book the sar Question No. as appears in your Questio Paper.

(ii) Do not leave blank page/pages in you Answer-book.

(iii) All questions are compulsory.

(iv) Internal choices are given in some questions the student has to attempt only one of the alternatives.

(v) Answers should be brief and to the point.

(vi) This Question paper contains five sections i.e. A, B, C, D and E.

(vii) Section–A has 16 MCQ (Multiple Choice Questions) 1 to 16 of 1 mark each.

(viii) Section–B has 5 very short answer type questions from 17 to 21 of 2 marks each.

(ix) Section–C has 6 short answer type questions from 22 to 27 of 3 marks each.

(x) Section–D has 4 long answer type questions from 28 to 31 of 4 marks each.

(xi) Section–E has 4 very long answer type questions from 32 to 35 of 5 marks each.

SECTION–A

1. The set of boys in a girls school is :

   (a) a null set

   (b) a singleton set

   (c) an infinite set

   (d) None of these. 1

2. The number of subsets of a set having n elements is :

   (a) $2n$

   (b) n^2

   (c) 2^n

   (d) $2^n - 1$. 1

3. If R is a relation on a finite set A having n elements, then the number of relations on A is :

   (a) 2^n

   (b) 2^{n^2}

   (c) n^2

   (d) n^n. 1

(viii) Section–B has 5 very short answer type questions from 17 to 21 of 2 marks each.

(ix) Section–C has 6 short answer type questions from 22 to 27 of 3 marks each.

(x) Section–D has 4 long answer type questions from 28 to 31 of 4 marks each.

(xi) Section–E has 4 very long answer type questions from 32 to 35 of 5 marks each.

SECTION–A

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   (a) a null set

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   (d) n^n. 1

4. The degree measure corresponding to $\frac{5\pi}{3}$ radian is :

(a) 210°

(b) 510°

(c) 300°

(d) None of these. 1

5. $\sin\left(\frac{\pi}{2}+x\right) =$ .....

(a) sin x

(b) cos x

(c) – sin x

(d) – cos x. 1

6. The Value of i^7 is :

(a) –i

(b) i

(c) –1

(d) 1.

7. The a+ib form of complex number $z = i$ is :

(a) Z = 0 + 0i

(b) Z = 0 + i

(c) Z = 1 + 0i

(d) Z = 1 + i.

8. If n = 5 and r = 3, then the value of ^nC_r is

(a) 10

(b) 30

(c) 10!

(d) 15!. 1

9 The 10th term of the G.P.

5, 25, 125, ... is

(a) 5^8

(b) 5^{10}

(c) 5^{12}

(d) 5^6. 1

10. The slope of a line passing through the points (3, – 2) and (7, – 2) is :

(a) 0

(b) 1

(c) –1

(d) Not defined. 1

11. The vertex of the parabola $y^2 = -4ax$ is :

(a) (–9, 0)

(b) (9, 0)

(c) (0, 0)

(d) None of these.

12. The foci of Ellipse $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ is :

(a) (0, 0)

(b) $(\pm ae, 0)$

(c) $(0, \pm ae)$

(d) None of these.

13. The value of $\lim_{x\to 0}\frac{e^x-1}{x}=$.....

(a) 0

(b) 1

(c) r

(d) e^x. 1

14. The value of $\lim_{x \to 0} \frac{\tan x}{x} =$ .....

(a) x

(b) 1

(c) 0

(d) ∞. 1

15. $\frac{d}{dx}(\tan x) =$ .....

(a) $-\operatorname{cosec}^2 x$

(b) $\sec x \tan x$

(c) $\sec^2 x$

(d) $\cos x$. 1

16. The derivative of $f(x) = 3$ at $x = 3$ is :

(a) 0

(b) 2

(c) 3

(d) 9.

SECTION–B

17. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second ? 2

18. Express in the form of a + ib

$$i^9 + i^{19}.$$

Or

Solve the following equation:

$$x^2 + 3x + 9 = 0.$$ 2

19. Evaluate $\frac{n!}{(n-r)!}$ when $n = 6$ and $r = 2$

Or

How many 4-digit numbers are there with no digit repeated ? 2

20. Find the derivative of :

$$f(x) = 5\sin x - 6\cos x + 7.$$ 2

21. Write the contrapositive of the statement, If x is a prime number, then x is odd. 2

SECTION–C

22. Prove that $\frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x.$ 3

23. Solve the inequality graphically :

$$x + y \geq 4, \quad 2x - y < 0.$$

Or

Solve the system of inequalities graphically: 3

$$3x - 7 > 2(x - 6), \quad 6 - x > 11 - 2x.$$

24. Without using distance formula, show that points (–2, –1), (4, 0), (3, 3) and (–3, 2) are the vertices of a Parallelogram.

Or

The line through the points (h, 3) and (4, 1) intersects the line $7x - 9y - 19 = 0$ at right angles. Find the value of h. 3

25. Find the equation of the circle passing through the points (2, 3) and (–1, 1) and whose centre is on the line $x - 3y - 11 = 0$.

Or

Find the Co-ordinates of the focus, axis of the parabola, the equation of directrix and length of latus rectum of $y^2 = 12x$. 3

26. If the origin is the centroid of triangle PQR with vertices P(2a, 2, 6), Q(–4, 3b, –10) and R(8, 14, 2C) then find the values of a, b and c. 3

Three coins are tossed once. Find the probability of getting :

(a) 3 tails

(b) Exactly two tails

(c) Almost 2 tails. 3

SECTION–D

28. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages ? 4

29. Find the domain and range of real function :

$$f(x) = -|x|.$$

Or

If $f(x) = x^2$, find $\frac{f(1.1) - f(1)}{(1.1 - 1)}$. 4

30. Using the Principles of Mathematical Inductio

Prove that :

$$1^3 + 2^3 + 3^3 + \ldots\ldots + n^3 = \left(\frac{n(n+1)}{2}\right)^2.$$

31. A fair coin with 1 marked on one face and on other and a fair die are both tossed, fin the probability that the sum of numbers tha turn up is :

(a) 3

(b) 12.

Or

If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find :

(a) P (E or F)

(b) P (not E and not F). 4

SECTION-E

32. Find the general solution for the equation :

$$\sin 2x + \cos x = 0.$$

Or

Find the value of other five trigonometric functions if $\cos x = -\frac{1}{2}$, x lies in 3rd quadrant. 5

33. Using Binomial theorem, evaluate $(96)^3$.

Or

Find the middle terms in the expansion of

$$\left(3 - \frac{x^3}{6}\right)^7.$$ 5

34. Find the sum to n terms of the sequence

7, 77, 777, 7777, ... to n terms. 5

35. Find the mean, variance and standard deviation using short cut method : 5

Classes	Frequency
30–40	3
40–50	7
50–60	12
60–70	15
70–80	8
80–90	3
90–100	2