

TENKASI
DISTRICTStandard 11
MATHEMATICS

Time Allowed: 3.00 Hours

Maximum Marks: 90

Part - I

Answer the following:

I. Choose the correct answer:

20 x 1 = 20

- The number of relations on a set containing 3 elements is
a) 9 b) 81 c) 512 d) 1024
- Let $X = \{1, 2, 3, 4\}$; $Y = \{a, b, c, d\}$ and $f = \{(1, a), (4, b), (2, c), (3, d), (2, d)\}$, then f is
a) an one to one function b) an onto function
c) a function which is not one to one d) not a function
- $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = |x| - 5$ then the range of f is
a) $(-\infty, -5)$ b) $(-\infty, 5)$ c) $[-5, \infty)$ d) $(-5, \infty)$
- Let R be the relation over the set of all straight lines in a plane such that lRm if $l \perp m$. then R is
a) symmetric b) reflexive
c) transitive d) an equivalence relation
- If $|x + 2| \leq 9$ then x belongs to
a) $(-11, 7)$ b) $(-\infty, -7) \cup [11, \infty)$ c) $[-11, 7]$ d) $(-\infty, -7)$
- If 3 is the logarithm of 343, then the base is
a) 5 b) 7 c) 6 d) 9
- The value of $\sqrt[4]{(-2)^4} = \underline{\hspace{2cm}}$.
a) 2 b) -2 c) 4 d) -4
- If $\cos 28^\circ + \sin 28^\circ = k^3$, then $\cos 17^\circ$ is equal to
a) $k^3/\sqrt{2}$ b) $-k^3/\sqrt{2}$ c) $\pm k^3/\sqrt{2}$ d) $-k^3/\sqrt{3}$
- Which of the following is not true?
a) $\sec \theta = 1/4$ b) $\tan \theta = 25$ c) $\cos \theta = -1$ d) $\sin \theta = -3/4$
- A wheel is spinning at 2 rad/sec. How many seconds will it take to make 10 complete rotations.
a) 10π sec b) 20π sec c) 5π sec d) 15π sec
- $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 179^\circ =$
a) 89 b) -1 c) 1 d) 0
- The value of $\sec^{-1}(-\sqrt{2})$ is
a) $\pi/4$ b) $\pi/6$ c) $3\pi/4$ d) $2\pi/3$
- Number of sides of a polygon having 44 diagonals is _____.
a) 4 b) $4!$ c) 11 d) 22
- The number of 10 digit number that can be written by using the digit 2 and 3 is
a) $10C_2 + 9C_2$ b) 2^{10} c) $2^{10} - 2$ d) $10!$
- In 3 fingers, the number of ways four rings can be worn is _____ ways.
a) $4^3 - 1$ b) 3^4 c) 68 d) 64

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16. If $(1 + x^2)(1 + x)^2 = a_0 + a_1x + a_2x^2 + \dots + x^{n+4}$ and if a_0, a_1, a_2 are in A.P. then n is
 a) 1 b) 2 c) 3 d) 4
17. The remainder when 38^{15} is divisible by 13 is
 a) 12 b) 1 c) 11 d) 5
18. The co-efficient of x^5 in the series e^{-2x} is
 a) $\frac{2}{3}$ b) $\frac{3}{2}$ c) $-\frac{4}{15}$ d) $\frac{4}{15}$
19. The n^{th} term of the sequence 2, 7, 14, 23 ... is
 a) $n^2 + 2n + 1$ b) $n^2 + 2n - 1$ c) $n^2 - 2n - 1$ d) $n^2 - 2n + 1$
20. If $\frac{1}{2}, \frac{1}{x}, \frac{1}{8}$ are in H.P, then what is the value of x ?
 a) 3 b) 4 c) 5 d) 6

Part - II

II. Answer any 7 questions. (Q.No. 30 is compulsory)

7 x 2 = 14

21. If $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$, find $n((A \cup B) \times A \cap B) \times (A \Delta B)$
22. Solve : $\sqrt{6 - 4x - x^2} = x + 4$
23. Prove that $\log_a 2 \log_b 2 \log_c 2 C = \frac{1}{8}$.
24. Find the value of (a) $\sin(-1110)$ (b) $\tan\left(\frac{19\pi}{3}\right)$
25. Find the general solution of $\cos \theta = -\frac{1}{2}$
26. Show that $\tan(45 - A) = \frac{1 - \tan A}{1 + \tan A}$
27. If $(n+2)P_4 = 42 \times nP_2$, find 'n'.
28. if a, b, c are in geometric progression and if $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ then prove that x, y, z are in arithmetic progression.
29. Find the sum : $1 + \frac{4}{5} + \frac{7}{25} + \frac{10}{125} + \dots$
30. If $\frac{1}{7!} + \frac{1}{9!} = \frac{A}{10!}$, find A.

Part - III

III. Answer any 7 questions. (Q.No. 40 is compulsory)

7 x 3 = 21

31. In the set, z of integers, define mRn if $m-n$ is divisible by 7. Prove that R is an equivalence relation.
32. Find the largest possible domain for the real valued function given by

$$f(x) = \frac{\sqrt{9 - x^2}}{\sqrt{x^2 - 1}}$$

33. If $\left(x^{\frac{1}{2}} + x^{-\frac{1}{2}}\right) = \frac{9}{2}$ then find the value of $\left(x^{\frac{1}{2}} - x^{-\frac{1}{2}}\right)$ for $x > 1$.

34. Prove that $32\sqrt{3} \sin \frac{\pi}{48} \cos \frac{\pi}{48} \cos \frac{\pi}{24} \cos \frac{\pi}{12} \cos \frac{\pi}{6} = 3$.

V11M

3

35. If the letters of the word IITJEE are permuted in all possible ways and the strings thus formed are arranged in the lexicographic order, find the rank of the word IITJEE.
36. Find the value of p for which the difference between the roots of the equation $x^2 + px + 8 = 0$ is 2.
37. There are 11 points in a plane. No three of these lies in the same straight line except 4 points, which are collinear. Find
- The number of straight line that can be obtained from the pairs of these points.
 - The number of triangles that can be formed for which the points are their vertices.
38. Compute the sum of first n terms of $8 + 88 + 888 + 8888 + \dots$
39. Find the coefficient of x^{15} in $\left(x^2 + \frac{1}{x^3}\right)^{10}$
40. If in two circles, arcs of the same length subtend angles 60° and 75° at the centre, Find the ratio of their radii.

Part - IV

IV. Answer all the questions.

7 x 5 = 35

41. a) If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 3x - 5$. Prove that f is a bijection and find its inverse.

(OR)

- b) Resolve into partial fraction $\frac{x^2 + 2x + 1}{x^2 + 5x + 6}$

42. a) If $\theta + \phi = \alpha$ and $\tan \theta = k \tan \phi$ then prove that $\sin(\theta - \phi) = \frac{k-1}{k+1} \sin \alpha$

(OR)

- b) A manufacturer has 600 litres of a 12 percent solution of acid. How many litres of a 30 percent acid solution must be added to it so that the acid content in the resulting mixture will be more than 15 percent but less than 18 percent.

43. a) By the principle of Mathematical Induction, prove that for $n \geq 1$

$$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$$

(OR)

- b) Solve : $\cos x + \sin x = \cos 2x + \sin 2x$

44. a) Find all values of x , that satisfies the inequality $\frac{2x-3}{(x-2)(x-4)} < 0$

(OR)

- b) An exam paper contains 8 questions 4 in Part-A and 4 in Part-B. Exammers are required to answer 5 questions. In how many ways can this be done if
- There are no restrictions of choosing a number of questions in either parts
 - Atleast two questions from Part-A must be answered.

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45. a) If $A + B + C = \pi$, prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2 \cos A \cos B \cos C$

(OR)

b) Prove that $\sqrt[3]{x^3 + 6} - \sqrt[3]{x^3 + 3}$ is approximately equal to $\frac{1}{x^2}$ when x is sufficiently large.

46. a) If the product of the 4th, 5th and 6th terms of a geometric progression is 4096 and if the product of the 5th, 6th and 7th terms of it is 32768. Find the sum of first 8 terms of the geometric progression.

(OR)

b) State and prove Napier's formula.

47. a) How many numbers greater than ten lakh can be formed with the digits 2,3,0,3,4,2,3

(OR)

b) Write the steps to obtain the graph of the function $y = 3(x - 1)^2 + 5$ from the graph $y = x^2$.

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