Fundamental of Mathematics - II

MATHEMATICS

Additional Problems For Self Practice (APSP)

PART - I : PRACTICE TEST PAPER

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

Max. Marks : 120 **Max. Time : 1 Hr.**

Important Instructions :

1. The test is of **1 hour** duration and max. marks 120.
2. The test consists **30** questions, **4 marks** each.
3. Only one choice is correct **1 mark** will be deducted for incorrect response. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
4. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 3 above.

1. The value of $\log_{(\sqrt{2}-1)} P$ where $P = 2+\cfrac{1}{2+\cfrac{1}{2+....\infty}}$ is
(1) 1 (2) –1 (3) 2 (4) –2

2. Which of the following is positive ?
(1) $\log_{\sin 1} \tan 1$ (2) $\log_{\cos 1} (1 + \tan 3)$ (3) $\log_{(\log_{10} 5)}(3)$ (4) $\log_{(2-\sqrt{3})}(2+\sqrt{3})$

3. Range of $y = \sin^6 x + \cos^6 x$ is
(1) $\left[\frac{1}{4}, 1\right]$ (2) $\left[\frac{1}{2}, 1\right]$ (3) $\left[\frac{3}{4}, 1\right]$ (4) [1, 2]

4. If $x + \frac{1}{x} = 2$ then $x^4 + \frac{1}{x^4}$ is equal to
(1) 2_4 (2) 2_8 (3) 2 (4) 1

5. Number of positive integers satisfying equation $||x-3|+2| = 5$ is
(1) 2 (2) 1 (3) 3 (4) None

6. $\tan(100^\circ) + \tan(125^\circ) + \tan(100^\circ)\tan(125^\circ) =$
(1) –1 (2) 2 (3) –2 (4) 1

7. Number of integral values of x satisfying $\log_4(2x^2 + 5x + 27) - \log_2(2x-1) \geq 0$
(1) 9 (2) 8 (3) 7 (4) 6

8. The value of expression $(\log_{10}2)_3 + (\log_{10}8)(\log_{10}5) + (\log_{10}5)_3$ is
(1) less than 1 (2) 1 (3) more than 1 (4) can't comment

9. Number of solutions of $\tan(2x) = \tan(x)$ in $(0, 3\pi)$ is :
(1) 3 (2) 2 (3) 6 (4) 4

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(1) 3 (2) 2 (3) 6 (4) 4

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10. If t is real and positive number, find the solution of . $\left|t-\frac{2}{t}\right|<1<\left(t+\frac{2}{t}\right)$
(1) t∈(1, 2) (2) t∈(2, 4) (3) t∈[1, 2) (4) t > 4

11. Sum of solutions of equation |3x –11| + x = 14
(1) $\frac{25}{4}$ (2) $\frac{9}{4}$ (3) $\frac{19}{4}$ (4) $\frac{7}{4}$

12. Number of integers not satisfying |x–2| + |x+5| ≥ 12
(1) 9 (2) 10 (3) 12 (4) 13

13. complete solution of $\left|\frac{3x+2}{x+4}\right| \le 1$
(1) (–4, 1] (2) $\left[-\frac{3}{2},1\right)$ (3) $\left[-\frac{3}{2},1\right]$ (4) $(-\infty, -4) \cup \left[-\frac{3}{2},\infty\right)$

14. Find value of 'a' for infinite solution of |x–2| + |x–3| = a
(1) 2 (2) 5/2 (3) 3 (4) 1

15. If solution of |x+4| + |x + 2| = |2x +6| is $(-\infty,-a]\cup[b,\infty)$ find 3a + 2b
(1) –16 (2) 8 (3) 16 (4) –8

16. If $\log_5 x + \log_x 5 = \frac{10}{3}$, find x
(1) two irrational solutions
(2) One irrational, one integer solution
(3) Two integral solutions
(4) Only one solution exists

17. Find x if $\log_{(x+1)}(1-x)=2$
(1) x = 0 (2) x = –3 (3) x = 0, –3 (4) No solution

18. Complete solution of $4_{2x-1} > 16_{x/2}$
(1) (1, ∞) (2) (3, ∞) (3) (–∞, 3) (4) (–∞, 1)

19. If a cosθ + b sinθ = 4, and asinθ – bcosθ = 3 then $a_2 + b_2$ has the value =
(1) 25 (2) 17 (3) 7 (4) None

20. If $\theta \in (0,\pi)$ such that tanθ + tan2θ +tan3θ = (tanθ) (tan2θ) (tan3θ), then θ =
(1) $\frac{\pi}{6},\frac{\pi}{3},\frac{2\pi}{3},\frac{5\pi}{6}$ (2) $\frac{\pi}{2},\frac{2\pi}{3}$ (3) $\frac{\pi}{3},\frac{5\pi}{6}$ (4) π/3

21. General value of θ which satisfies both the equation $\sin\theta = \frac{1}{2}$ and $\cos\theta = \frac{-\sqrt{3}}{2}$
(1) $n\pi + (-1)_n \frac{\pi}{6}$ (2) $2n\pi \pm \frac{\pi}{3}$ (3) $2n\pi + \frac{5\pi}{6}$ (4) $2n\pi \pm \frac{5\pi}{6}$

22. Solve : sin2x + 5sinx + 1 + 5cosx = 0
(1) $n\pi + \frac{\pi}{4}$ (2) $n\pi - \frac{\pi}{4}$ (3) $2n\pi + \frac{\pi}{4}$ (4) 2nπ

23. Solve the inequality, sinx < $\frac{1}{2}$
(1) $\left(2n\pi-\frac{5\pi}{6},2n\pi+\frac{\pi}{6}\right)$ (2) $\left(2n\pi-\frac{7\pi}{6},2n\pi+\pi/6\right)$ (3) $\left(2n\pi+\frac{\pi}{6},2n\pi+\frac{5\pi}{6}\right)$ (4) $\left(2n\pi-\frac{\pi}{6},\ \ 2n\pi+\frac{5\pi}{6}\right)$

24. Find cos70° cos50° cos30° cos10°

(1) $\frac{1}{16}$ (2) $\frac{3}{8}$ (3) $\frac{3}{16}$ (4) $\frac{5}{8}$

25. Find the minimum and maximum value of y = 3 + 15sinx + 20 cosx
(1) 22, 25 (2) –22, 25 (3) –22, 28 (4) –25, 28

26. Least positive integer satisfying $(x-3)_3\ (x+1)\ (x-1)_2 \geq 0$
(1) 3 (2) 1 (3) 2 (4) 4

27. Evaluate : $(\log 50)(\log 200) + (\log 2)_2$
(1) 1 (2) 2 (3) 3 (4) 4

28. If log2 = a and log3 = b then $\log_{1000} 4 + \log_{100} 27$ is
(1) $\frac{2}{3}a+\frac{3}{2}b$ (2) $\frac{3}{2}a+\frac{2}{3}b$ (3) $\frac{3}{4}a+\frac{4}{3}b$ (4) $\frac{2}{3}a+\frac{2}{3}b$

29. Sum of all solutions of $x_{1+\log x} = 10x$
(1) $\frac{10}{101}$ (2) $\frac{101}{10}$ (3) $\frac{99}{100}$ (4) $\frac{100}{99}$

30. Solve for x: $\sqrt{8-x} \geq x-2$
(1) [–1,4] (2) [2,4] (3) $(-\infty,4]$ (4)[3,4]

Practice Test (JEE-Main Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

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1 The domain of function $f(x) = \log_4[\log_5\{\log_3(18x - x^2 - 77)\}]$ is
(1) $x \in (8, 10)$ (2) $x \in (6, 9)$ (3) $x \in (5, 10)$ (4) $x \in (5, 9)$

2. Number of real solution of the equation $|x-3|^{3x^2-10x+3} = 1$
(1) 4 (2) 3 (3) 2 (4) 1

3. If $\log_M N = \alpha + \beta$, where α is an integer and β is [0, 1) and if M & α are are twin prime, satisfying $\alpha + m = 8$ then the greatest integral value of N is
(1) 624 (2) 625 (3) 728 (4) 729

4. If $\frac{3\pi}{4} < \alpha < \pi$, then $\sqrt{2\cot\alpha + \frac{1}{\sin^2\alpha}}$ is equal to
(1) $1 + \cot\alpha$ (2) $-1 - \cot\alpha$ (3) $1 - \cot\alpha$ (4) $-1 + \cot\alpha$

5. The number of all possible triplets (a_1, a_2, a_3) such that $a_1 + a_2 \cos 2x + a_3 \sin^2 x = 0$ for all x is
(1) 0 (2) 1 (3) 2 (4) infinite

6. If three angles A, B, C are such that $\cos A + \cos B + \cos C = 0$ and if
$\lambda \cos A \cos B \cos C = \cos 3A + \cos 3B + \cos 3C$, then value of λ is :
(1) 10 (2) 11 (3) 12 (4) 13

7*. The values of x satisfying the equation $(x-1)^{\log_3 x^2 - 2\log_x 9} = (x-1)^7$ is/are
(1) $\frac{1}{\sqrt{3}}$ (2) 1 (3) 2 (4) 81

8*. If $P_n = \cos^n\theta + \sin^n\theta$ and $Q_n = \cos^n\theta - \sin^n\theta$, then which of the following is/are true.
(1) $P_n - P_{n-2} = -\sin^2\theta \cos^2\theta P_{n-4}$ (2) $Q_n - Q_{n-2} = -\sin^2\theta \cos^2\theta Q_{n-4}$
(3) $P_4 = 1 - 2\sin^2\theta \cos^2\theta$ (4) $Q_4 = \cos^2\theta - \sin^2\theta$

Comprehension # (Q.9 to 10)

Consider $||x-3| - \log_{10} M| = 4$

9. Integral values of M such that above equation has only 2 real distinct solutions are
(1) 999 (2) 1000 (3) 10^4 (4) 9999

10. Least integral value of M such that above equation has 4 distinct solutions is
(1) 10^4 (2) 1000 (3) 1001 (4) 9999

11. The set of values of x satisfying simultaneously the inequalities $\frac{\sqrt{(x-8)\ (2-x)}}{\log_{0.3}\left(\frac{10}{7}\ (\log_2 5 - 1)\right)} \geq 0$ and
$2^{x-3} - 31 > 0$ is :
(1) a unit set (2) an empty set
(3) an infinite set (4) a set consisting of exactly two elements.

12*. Let $a > 2$, $a \in N$ be a constant. If there are just 18 positive integers satisfying the inequality $(x-a)(x-2a)(x-a_2) < 0$ then which of the option(s) is/are correct?
(1) 'a' is composite (2) 'a' is odd (3) 'a' is greater than 8 (4) 'a' lies in the interval (3,11)

Comprehension # (Q.13 to 14)

Let $x = \sqrt[3]{2+\sqrt{5}} + \sqrt[3]{2-\sqrt{5}}$

13. $x^3 + 3x$ is equal to
(1) 1 (2) 2 (3) 3 (4) 4

14. x is not equal to

(1) a rational number (2) an integer (3) a composite number (4) a natural number

15*. Consider $f(x) = |10 – x| + |9 – x| + |8 – x| ..... |1– x| + |x|$

(1) f(x) is minimum at x = 5 (2) f(x) is minimum at x = 55

(3) minimum value of f(x) = 30 (4) minimum value of f(x) = 20

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Answers

PART-I

1.	(2)	**2.**	(2)	**3.**	(1)	**4.**	(3)	**5.**	(2)	**6.**	(4)	**7.**	(4)
8.	(2)	**9.**	(2)	**9.**	(2)	**10.**	(1)	**11.**	(3)	**12.**	(3)	**13.**	(3)
14.	(4)	**15.**	(2)	**16.**	(2)	**17.**	(4)	**18.**	(1)	**19.**	(1)	**20.**	(4)
21.	(3)	**22.**	(2)	**23.**	(2)	**24.**	(3)	**25.**	(3)	**26.**	(2)	**27.**	(4)
28.	(1)	**29.**	(2)	**30.**	(3)								

PART-II

1	(1)	**2.**	(2)	**3.**	(3)	**4.**	(2)	**5.**	(4)	**6.**	(3)	**7.**	(3,4)
8.	(1,2,3,4)		**9.**	(2)	**10.**	(3)	**11.**	(1)	**12.**	(2, 4)	**13.**	(4)	
14.	(3)	**15.**	(1,3)										