

**SAMPLE CONTENT**



# 22 MODEL QUESTION PAPERS WITH SOLUTIONS



**PHYSICS**

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# MHT-CET

# 22 MODEL QUESTION PAPERS WITH SOLUTIONS

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- Set of 22 question papers with solutions each for Physics, Chemistry, Mathematics and Biology.
- Prepared as per the latest paper pattern of MHT-CET.
- Exhaustive coverage of MCQs for Practice.
- Detailed Solutions provided to difficult MCQs for easy comprehension
- 20 Model Question Papers with answers and solutions are provided in book while 2 Model Question Papers with solutions are provided through Q.R. code.

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## PREFACE

In the enchanting world of education, where curiosity ignites minds and knowledge illuminates paths, we proudly present a compendium of intellectual challenges, ‘**MHT-CET: 22 Model Question Papers with Solutions (PCMB)**’. It is a meticulously designed book to assess the threshold of knowledge imbibed by the students over a period of two years in the junior college. 20 Model Question Papers with answers and solutions are provided in book while 2 Model Question Papers with the solutions are provided through Q.R. code.

The book charts out a compilation of Model Question Papers for the students appearing for the MHT-CET examination. Every question paper in this book has been created in line with the examination pattern and touches upon all the conceptual nodes of Physics, Chemistry, Mathematics and Biology. The core objective of this book is to gauge the student’s preparedness to appear for the examination. To aid students, detailed solutions are provided to difficult MCQs.

We hope that this book will enable students to optimize their time-management abilities to achieve high scores in the examination.

They say, ‘*With the right tools, even ordinary men achieve extraordinary results*’. We aspire this book to be the perfect tool that would help students to take off their career in the most extraordinary way possible.

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This reference book is transformative work based on the Std. XI and XII - Physics, Chemistry, Mathematics and Biology Textbooks published by the Maharashtra State Board of Secondary and Higher Secondary Education, Pune. We the publishers are making this book which constitutes as fair use of textual contents which are transformed in the form of Multiple Choice Questions and their relevant solutions; with a view to enable the students to understand memorize and reproduce the same in MHT-CET examination.

This work is purely inspired by the paper pattern prescribed by State Common Entrance Test Cell, Government of Maharashtra. Every care has been taken in the publication of this reference book by the Authors while creating the contents. The Authors and the Publishers shall not be responsible for any loss or damages caused to any person on account of errors or omissions which might have crept in or disagreement of any third party on the point of view expressed in the reference book.

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## MHT-CET PAPER PATTERN

- There will be three papers of Multiple Choice Questions (MCQs) in ‘Mathematics’, ‘Physics and Chemistry’ and ‘Biology’ of 100 marks each.
- Duration of each paper will be 90 minutes.
- Questions will be based on the syllabus prescribed by Maharashtra State Board of Secondary and Higher Secondary Education with approximately 20% weightage given to Std. XI and 80% weightage will be given to Std. XII curriculum.
- Difficulty level of questions will be at par with JEE (Main) for Mathematics, Physics, Chemistry and at par with NEET for Biology.
- There will be no negative marking.
- Questions will be mainly application based.
- Details of the papers are as given below:



Paper	Subject(s)	No. of MCQs based on		Mark(s) Per Question	Total Marks	Duration in Minutes
		Std XI	Std XII			
Paper I	Mathematics	10	40	2	100	90
Paper II	Physics	10	40	1	100	90
	Chemistry	10	40			
Paper III	Biology	20	80	1	100	90

- Questions will be set on
  - the entire syllabus of Std. XII of Physics, Chemistry, Mathematics and Biology subjects prescribed by Maharashtra Bureau of Textbook Production and curriculum Research, Pune, and
  - chapters / units from Std. XI curriculum as mentioned below:

Sr.no	Subject	Chapters/Units of Std. XI
1	Physics	Motion in a Plane, Laws of Motion, Gravitation, Thermal Properties of Matter, Sound, Optics, Electrostatics, Semiconductors
2	Chemistry	Some Basic Concepts of Chemistry, Structure of Atom, Chemical Bonding, Redox Reactions, Elements of Group 1 and Group 2, States of Matter (Gaseous and Liquid States), Adsorption and Colloids (Surface Chemistry), Hydrocarbons, Basic Principles of Organic Chemistry
3	Mathematics	Trigonometry II, Straight Line, Circle, Measures of Dispersion, Probability, Complex Numbers, Permutations and Combinations, Functions, Limits, Continuity
4	Biology	Biomolecules, Respiration and Energy Transfer, Human Nutrition, Excretion and Osmoregulation

- **Language of Question Paper:**  
The medium for examination shall be English / Marathi / Urdu for Physics, Chemistry and Biology. Mathematics paper shall be in English only.
  - **Duration of Online Computer Based Test (CBT):**  
The duration of the examination for PCB is 180 minutes and PCM is 180 minutes.
    - For PCM** - This paper is having 2 Groups of Physics-Chemistry and Mathematics with total 180 Minutes Duration, first 90 minutes Physics and Chemistry will be enabled and only after completion of first 90 minutes’ time Physics-Chemistry group will be auto submitted and Mathematics group will be enabled with 90 minutes’ duration.
    - For PCB** - This paper is having 2 Groups of Physics-Chemistry and Biology with total 180 Minutes Duration, first 90 minutes Physics and Chemistry will be enabled and only after completion of time response for Physics-Chemistry group will be auto submitted and Biology group will be enabled with 90 minutes’ duration.
- [Note :** Candidate should note that if he/she appearing for both the groups i.e. PCM and PCB, the Percentile / Percentage score of Physics or Chemistry will not be interchanged among the groups.]

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**Note:** Questions of standard XI are indicated by ‘\*’ in each test.

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# MODEL TEST – 01 (Paper - I)

1.  $\int_{-\frac{\pi}{8}}^{\frac{\pi}{8}} \log\left(\frac{2-\sin x}{2+\sin x}\right) dx =$
- (A)  $\frac{\pi}{8}$  (B)  $\frac{\pi}{2}$   
 (C)  $\frac{\pi}{4}$  (D) 0
2. For which values of  $x$  is the matrix  $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$  non-invertible?
- (A)  $-4, 0$  (B)  $2, 0$   
 (C)  $4, 0$  (D)  $-2, 0$
3. If  $A(1, 3, 2)$ ,  $B(a, b, -4)$  and  $C(5, 1, c)$  are the vertices of triangle ABC and  $G(3, b, c)$  is its centroid, then
- (A)  $a = \frac{1}{2}, b = 1, c = 2$   
 (B)  $a = 3, b = -1, c = \frac{1}{3}$   
 (C)  $a = 3, b = 2, c = -1$   
 (D)  $a = \frac{1}{2}, b = 2, c = -1$
4. If  $\sin^{-1} x = \frac{\pi}{10}$ , for some  $x \in [-1, 1]$ , then the value of  $\cos^{-1} x$  is
- (A)  $\frac{\pi}{10}$  (B)  $\frac{2\pi}{5}$   
 (C)  $\frac{4\pi}{5}$  (D)  $\frac{7\pi}{10}$
5. The direction ratios of the line  $2x - 1 = 3y + 2 = z - 2$  are
- (A)  $3, 2, 6$  (B)  $3, 2, -6$   
 (C)  $3, -1, -6$  (D)  $-3, 1, 6$
6.  $\int e^x \left( \frac{\sqrt{1-x^2} \cdot \sin^{-1} x + 1}{\sqrt{1-x^2}} \right) dx =$
- (A)  $e^x \sqrt{1-x^2} + c$  (B)  $\frac{e^x}{\sqrt{1-x^2}} + c$   
 (C)  $e^x \sin^{-1} x + c$  (D)  $e^x \cos^{-1} x + c$
7. Area bounded by the curve  $7xy - 7x - 7y - 2 = 0$ , X-axis and the lines  $x = 2, x = 3$  is
- (A)  $1 - \frac{7}{9} \log 2$  sq. units  
 (B)  $1 + \frac{7}{9} \log 2$  sq. units  
 (C)  $1 - \frac{9}{7} \log 2$  sq. units  
 (D)  $1 + \frac{9}{7} \log 2$  sq. units
8.  $\cos^{-1} \left( \cos \frac{4\pi}{3} \right) =$
- (A)  $\frac{5\pi}{6}$  (B)  $\frac{\pi}{3}$   
 (C)  $\frac{4\pi}{3}$  (D)  $\frac{2\pi}{3}$
9. If  $A$  is a  $3 \times 3$  matrix and  $|A| = 2$ , then the matrix represented by  $A$  ( $\text{adj}A$ ) is equal to
- (A)  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$  (B)  $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$   
 (C)  $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$  (D)  $\begin{bmatrix} 0 & 2 & 0 \\ 2 & 0 & 0 \\ 2 & 0 & 0 \end{bmatrix}$
10. The volume of tetrahedron whose vertices are  $A(3, 7, 4)$ ,  $B(5, -2, 3)$ ,  $C(-4, 5, 6)$ ,  $D(1, 2, 3)$  is
- (A)  $\frac{43}{6}$  cu.units (B)  $43$  cu.units  
 (C)  $\frac{46}{3}$  cu.units (D)  $\frac{6}{43}$  cu.units
11.  $\int \frac{\cos x + x \sin x}{x(x + \cos x)} dx =$
- (A)  $\log \left| \frac{1}{x + \cos x} \right| + c$  (B)  $\log \left| \frac{x}{x + \cos x} \right| + c$   
 (C)  $\log \left| \frac{1}{x + \sin x} \right| + c$  (D)  $\log \left| \frac{x}{x + \sin x} \right| + c$
12.  $\int_0^{\frac{\pi}{4}} \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx =$
- (A)  $\log \left( \frac{8}{3} \right)$  (B)  $\log \left( \frac{4}{3} \right)$   
 (C)  $\frac{1}{2} \log \left( \frac{8}{3} \right)$  (D)  $\frac{1}{2} \log \left( \frac{4}{3} \right)$



- \*13. The value of  $\tan 57^\circ - \tan 12^\circ - \tan 57^\circ \tan 12^\circ$  is  
 (A)  $\tan 69^\circ$  (B)  $\tan 45^\circ$   
 (C) 0 (D)  $\tan 57^\circ$
14. The XZ plane divides the line segment joining the points (3, 2, b) and (a, -4, 3) in the ratio  
 (A) 1 : 2 (B) 2 : 3  
 (C) 3 : 1 (D) 4 : 3
15. If  $(\bar{a} + 2\bar{b} - \bar{c}) \cdot [(\bar{a} - \bar{b}) \times (\bar{a} - \bar{b} - \bar{c})] = k[\bar{a} \cdot \bar{b} \cdot \bar{c}]$ , then the value of k is  
 (A) 1 (B) 2  
 (C) 3 (D) 4
16. In a  $\Delta ABC$ ,  
 $a(\cos^2 B + \cos^2 C) + \cos A (c \cos C + b \cos B) =$   
 (A) 0 (B) a  
 (C) b (D) c
17. Find k, if the slope of one of the lines given by  $kx^2 + 8xy + y^2 = 0$  exceeds the slope of the other by 6.  
 (A) 6 (B) 7  
 (C) -6 (D) -7
18.  $\int \frac{1}{\sin x \cdot \cos x} dx =$   
 (A)  $\log |\sin x| + c$   
 (B)  $\log |\cos x| + c$   
 (C)  $\log |\tan x| + c$   
 (D)  $\log |\sec x| + c$
- \*19. The equation of circle whose diameter lies on  $3x + 5y = -7$  and  $2x - y = 4$  which passes through  $(-5, \frac{1}{2})$  is  
 (A)  $x^2 + y^2 - 2x + 4y = 149$   
 (B)  $x^2 + y^2 - 2x + 4y = \frac{149}{4}$   
 (C)  $x^2 + y^2 + 2x - 4y = 149$   
 (D)  $x^2 + y^2 + 2x - 4y = \frac{149}{4}$
20. The length of the perpendicular from (0, 2, 3) to the line  $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$  is  
 (A) 4 (B)  $\sqrt{21}$   
 (C)  $\sqrt{41}$  (D) 7
21. The combined equation of the pair of lines through origin such that one is parallel to  $3x + 2y = 3$  and the other is perpendicular to  $6x + 3y + 17 = 0$  is  
 (A)  $3x^2 + 4xy + 4y^2 = 0$   
 (B)  $3x^2 - 4xy - 4y^2 = 0$   
 (C)  $3x^2 - 4xy + 4y^2 = 0$   
 (D)  $3x^2 - 8xy + 4y^2 = 0$

22. If  $|\bar{a}| = 10$ ,  $|\bar{b}| = 2$ , then  $\sqrt{|\bar{a} \times \bar{b}|^2 + |\bar{a} \cdot \bar{b}|^2} =$   
 (A) 10 (B) 20  
 (C) 40 (D) 50
23. The area bounded by the curve  $y = f(x)$ , X-axis and ordinates  $x = 1$  and  $x = a$  is  $(a - 1) \cos(2a + 7)$ , then  $f(x)$  is  
 (A)  $2(1 - x) \sin(2x + 7) + \cos(2x + 7)$   
 (B)  $(a - 1) \sin(2x + 7) + 2 \cos(2x + 7)$   
 (C)  $(1 - a) \cos(2x + 7) + 3 \sin(2x + 7)$   
 (D)  $2(x - 1) \cos(2x + 7) + \sin(2x + 7)$
24. In  $\Delta ABC$ , if  $(a + b - c)(a + b + c) = 3ab$ , then  
 (A)  $\angle A + \angle B = 60^\circ$   
 (B)  $\angle A + \angle B = 90^\circ$   
 (C)  $\angle A + \angle B = 120^\circ$   
 (D)  $\angle A + \angle B = 150^\circ$
25. A plane passes through (1, -2, 1) and is perpendicular to two planes  $2x - 2y + z = 0$  and  $x - y + 2z = 4$ . The distance of the plane from the point (1, 2, 2) is  
 (A) 0 (B) 1  
 (C)  $\sqrt{2}$  (D)  $2\sqrt{2}$
- \*26.  $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x^2 - 1} =$   
 (A) 0 (B)  $-\frac{1}{2}$   
 (C)  $-\frac{7}{3}$  (D)  $-\frac{5}{2}$
27.  $P(x) = \begin{cases} \frac{1}{k} \binom{5}{x}, & x = 0, 1, 2, 3, 4, 5; k > 0 \\ 0, & \text{otherwise} \end{cases}$   
 is p.m.f. of a r.v. X. Then  $\frac{1}{k}$  is equal to  
 (A) 16 (B)  $\frac{1}{16}$   
 (C)  $\frac{1}{32}$  (D) 32
- \*28. Let A (2, 3), B (3, -6), C (5, -7) be three points. If P is a point satisfying the condition  $PA^2 + PB^2 = 2 PC^2$ , then a point that lies on the locus of P is  
 (A) (2, -5) (B) (-2, 5)  
 (C) (13, 10) (D) (-13, -10)
29. Degree of the given differential equation  $\left(\frac{d^3 y}{dx^3}\right)^2 = \left(1 + \frac{dy}{dx}\right)^{\frac{1}{3}}$  is  
 (A) 2 (B) 3  
 (C)  $\frac{1}{2}$  (D) 6



30. Let  $g(x)$  be the inverse of the function  $f(x)$  and  $f'(x) = \frac{2}{x^2+3}$ , then  $2g'(x)$  is equal to

- (A)  $\frac{1}{3+[g(x)]^2}$  (B)  $\frac{1}{3+[f(x)]^2}$   
 (C)  $3+[g(x)]^2$  (D)  $3+[f(x)]^2$

\*31. If  $z \neq 1$  and  $\frac{z^2}{z-1}$  is real, then the point represented by the complex number  $z$  lies

- (A) either on the real axis or on a circle passing through the origin  
 (B) on a circle with centre at the origin  
 (C) either on the real axis or on a circle not passing through the origin  
 (D) on the imaginary axis

32. If  $p$  : Every natural number is a real number.  
 $q$  : Every integer is a complex number. Then truth values of  $p \rightarrow q$  and  $p \leftrightarrow q$  are \_\_\_\_\_ and \_\_\_\_\_ respectively.

- (A) F, F (B) T, F  
 (C) F, T (D) T, T

33. The differential equation having  $y = (\cos^{-1}x)^2 + P(\sin^{-1}x) + Q$  as its general solution, where  $P$  and  $Q$  are arbitrary constants, is

- (A)  $(1-x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 2$   
 (B)  $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 2$   
 (C)  $(1-x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 2y$   
 (D) None of these

\*34. The number of discontinuities of the greatest integer function  $f(x) = [x]$ ,  $x \in \left(-\frac{7}{2}, 100\right)$  is equal to

- (A) 104 (B) 100  
 (C) 102 (D) 103

35. The maximum value of  $P = 7x + 6y$  subject to constraints  $x + 2y \leq 24$ ,  $2x + y \leq 30$  and  $x \geq 0, y \geq 0$  is

- (A) 90 (B) 120  
 (C) 96 (D) 240

\*36. The inverse of the function  $y = \frac{16^x - 16^{-x}}{16^x + 16^{-x}}$  is

- (A)  $\log_{16}(2-x)$  (B)  $\frac{1}{2} \log_{16} \frac{1+x}{1-x}$   
 (C)  $\frac{1}{2} \log_{16}(2x-1)$  (D)  $\frac{1}{4} \log_{16} \frac{2x}{2-x}$

37. The probability distribution of a r.v.  $X$  is

$X = x$	-3	-2	-1	0	1
$P(X = x)$	0.3	0.2	0.25	0.1	0.15

Then  $F(-1) =$

- (A) 0.5 (B) 0.75  
 (C) 0.9 (D) 12

\*38. If  $\alpha = {}^m C_2$ , then  ${}^\alpha C_2$  is equal to

- (A)  ${}^{m+1} C_4$  (B)  ${}^{m-1} C_4$   
 (C)  $3 \cdot {}^{m+2} C_4$  (D)  $3 \cdot {}^{m+1} C_4$

39. The mean and variance of a binomial distribution are 2 and 1 respectively, then the probability of getting exactly three successes in this distribution is

- (A) 0.25 (B) 0.75  
 (C) 0.52 (D) 0.57

40.  $y = 3 \cos 2x$  is a solution of the differential equation

- (A)  $\frac{dy}{dx} + 6y = 0$  (B)  $\frac{dy}{dx} - 6y = 0$   
 (C)  $\frac{d^2y}{dx^2} + 4y = 0$  (D)  $\frac{d^2y}{dx^2} - 4y = 0$

41. The symbolic form of the statement 'It is not true that Mathematics is not difficult and interesting' is

- (A)  $\sim(\sim p \wedge q)$  (B)  $(\sim p \vee q)$   
 (C)  $(\sim p \vee \sim q)$  (D)  $\sim(\sim p \vee q)$

42. The family of curves  $y = e^{a \sin x}$ , where  $a$  is an arbitrary constant, is represented by the differential equation

- (A)  $\log y = \tan x \frac{dy}{dx}$   
 (B)  $y \log y = \tan x \frac{dy}{dx}$   
 (C)  $y \log y = \sin x \frac{dy}{dx}$   
 (D)  $\log y = \cos x \frac{dy}{dx}$

43. If  $y = \sec x + x^{\log x}$ , then  $\frac{dy}{dx}$  is

- (A)  $\sec x \tan x + \frac{2}{x} \log x \cdot (x^{\log x})$   
 (B)  $\sec^2 x + \frac{x}{2} \log x$   
 (C)  $\sec^2 x + \frac{2}{x} \log x$   
 (D)  $\sec x \tan x + \frac{1}{x} \log x$





44. If  $p$ : Reshama is hardworking,  $q$ : Reshama is successful, then the verbal form of  $\sim p \wedge \sim q$  is
- (A) Reshama is not hardworking and she is successful.  
(B) Reshama is not hardworking or she is not successful.  
(C) Reshama is not hardworking or she is not successful.  
(D) Reshama is not hardworking and she is not successful.
- \*45. Ram is visiting a friend. Ram knows that his friend has 2 children and 1 of them is a boy. Assuming that a child is equally likely to be a boy or a girl, then the probability that the other child is a girl, is
- (A)  $\frac{1}{2}$                       (B)  $\frac{1}{3}$   
(C)  $\frac{2}{3}$                       (D)  $\frac{7}{10}$
46. If  $f(x) = px^5 + qx^4 + 5x^3 - 10$  has local maximum and minimum at  $x = 1$  and  $x = 3$  respectively then  $(p, q) =$
- (A)  $(0, 1)$                       (B)  $(1, -5)$   
(C)  $(1, 0)$                       (D)  $(3, -5)$
47.  $\frac{d}{dx} [\cos(3x + 2)] =$
- (A)  $\sin(2x + 3)$                       (B)  $2 \sin(3x + 2)$   
(C)  $-\sin(2x + 3)$                       (D)  $-3 \sin(3x + 2)$
48. A circular plate is contracting at the uniform rate of  $5\text{cm}^2/\text{sec}$ . The rate at which the perimeter is decreasing when the radius of the circle is 10 cm long is
- (A)  $\frac{1}{2} \text{ cm/sec}$                       (B)  $\frac{1}{3} \text{ cm/sec}$   
(C)  $\frac{1}{4} \text{ cm/sec}$                       (D) none of these
- \*49. The means of two samples of sizes 60 and 120 respectively are 35.4 and 30.9 and the standard deviations are 4 and 5. Obtain the standard deviation of the sample of size 180 obtained by combining the two samples.
- (A) 5.15                      (B) 26.5  
(C) 32.4                      (D) 51.5
50. A man of height 1.9 m walks directly away from a lamp of height 4.75m on a level road at 6m/s. The rate at which the length of his shadow is increasing is
- (A) 1m/s                      (B) 2m/s  
(C) 3m/s                      (D) 4m/s

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To see complete chapter buy **Target Notes** or **Target E-Notes**

**Model Test - 01****Paper - I**

1. (D) 2. (A) 3. (C) 4. (B) 5. (A) 6. (C) 7. (D) 8. (D) 9. (B) 10. (C)  
11. (B) 12. (B) 13. (B) 14. (A) 15. (C) 16. (B) 17. (B) 18. (C) 19. (B) 20. (B)  
21. (B) 22. (B) 23. (A) 24. (C) 25. (D) 26. (B) 27. (C) 28. (D) 29. (D) 30. (C)  
31. (A) 32. (D) 33. (B) 34. (D) 35. (B) 36. (B) 37. (B) 38. (D) 39. (A) 40. (C)  
41. (A) 42. (B) 43. (A) 44. (D) 45. (A) 46. (B) 47. (D) 48. (A) 49. (A) 50. (D)

**Paper - II**

1. (C) 2. (B) 3. (C) 4. (C) 5. (B) 6. (B) 7. (A) 8. (A) 9. (B) 10. (C)  
11. (D) 12. (C) 13. (C) 14. (C) 15. (A) 16. (C) 17. (D) 18. (D) 19. (D) 20. (B)  
21. (B) 22. (A) 23. (A) 24. (D) 25. (A) 26. (A) 27. (B) 28. (D) 29. (C) 30. (D)  
31. (A) 32. (B) 33. (D) 34. (B) 35. (C) 36. (D) 37. (D) 38. (D) 39. (B) 40. (B)  
41. (B) 42. (B) 43. (A) 44. (C) 45. (A) 46. (C) 47. (A) 48. (D) 49. (A) 50. (C)  
51. (A) 52. (C) 53. (B) 54. (A) 55. (C) 56. (B) 57. (A) 58. (C) 59. (B) 60. (C)  
61. (A) 62. (B) 63. (A) 64. (C) 65. (B) 66. (B) 67. (A) 68. (B) 69. (A) 70. (C)  
71. (A) 72. (C) 73. (A) 74. (D) 75. (C) 76. (C) 77. (C) 78. (D) 79. (A) 80. (D)  
81. (A) 82. (B) 83. (A) 84. (B) 85. (A) 86. (D) 87. (B) 88. (A) 89. (C) 90. (C)  
91. (C) 92. (D) 93. (B) 94. (B) 95. (D) 96. (B) 97. (C) 98. (A) 99. (D) 100. (D)

**Paper - III**

1. (B) 2. (C) 3. (B) 4. (D) 5. (B) 6. (B) 7. (B) 8. (C) 9. (D) 10. (C)  
11. (C) 12. (D) 13. (C) 14. (A) 15. (A) 16. (A) 17. (D) 18. (A) 19. (A) 20. (A)  
21. (D) 22. (D) 23. (B) 24. (C) 25. (D) 26. (A) 27. (D) 28. (C) 29. (B) 30. (B)  
31. (A) 32. (C) 33. (C) 34. (C) 35. (B) 36. (C) 37. (A) 38. (A) 39. (C) 40. (A)  
41. (B) 42. (D) 43. (D) 44. (D) 45. (C) 46. (C) 47. (C) 48. (A) 49. (C) 50. (B)  
51. (B) 52. (B) 53. (B) 54. (A) 55. (B) 56. (D) 57. (D) 58. (B) 59. (C) 60. (A)  
61. (A) 62. (D) 63. (B) 64. (A) 65. (D) 66. (C) 67. (C) 68. (C) 69. (D) 70. (C)  
71. (A) 72. (B) 73. (C) 74. (B) 75. (D) 76. (A) 77. (D) 78. (D) 79. (B) 80. (A)  
81. (B) 82. (A) 83. (A) 84. (A) 85. (C) 86. (B) 87. (A) 88. (B) 89. (B) 90. (A)  
91. (A) 92. (B) 93. (D) 94. (C) 95. (D) 96. (D) 97. (C) 98. (D) 99. (C) 100. (D)

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To see complete chapter buy **Target Notes** or **Target E-Notes**



**Model Test - 01**

**Paper - I**

1. Let  $f(x) = \log\left(\frac{2 - \sin x}{2 + \sin x}\right)$

$\therefore f(-x) = \log\left(\frac{2 - \sin(-x)}{2 + \sin(-x)}\right)$   
 $= -\log\left(\frac{2 - \sin x}{2 + \sin x}\right)$

$= -f(x)$

$\therefore f(x)$  is an odd function.

$\therefore \int_{-\frac{\pi}{8}}^{\frac{\pi}{8}} \log\left(\frac{2 - \sin x}{2 + \sin x}\right) dx = 0$

2. For the given matrix to be non-invertible,

$$\begin{vmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{vmatrix} = 0$$

Applying  $R_1 \rightarrow R_1 - R_2$  and  $R_3 \rightarrow R_3 - R_2$ , we get

$$\begin{vmatrix} 0 & x & -x \\ 3 & -1 & x+2 \\ x & 0 & -x \end{vmatrix} = 0$$

$\Rightarrow -x(-3x - x^2 - 2x) - x(x) = 0$

$\Rightarrow -3x - x^2 - 2x + x = 0$

$\Rightarrow -x^2 - 4x = 0$

$\Rightarrow x = 0, -4$

3.  $G \equiv \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}, \frac{z_1+z_2+z_3}{3}\right)$

$\Rightarrow (3, b, c) \equiv \left(\frac{a+6}{3}, \frac{b+4}{3}, \frac{c-2}{3}\right)$

$\Rightarrow 3 = \frac{a+6}{3}, b = \frac{b+4}{3}, c = \frac{c-2}{3}$

$\Rightarrow a = 3, b = 2, c = -1$

4. Given,  $\sin^{-1} x = \frac{\pi}{10}$

Since,  $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

$\therefore \frac{\pi}{10} + \cos^{-1} x = \frac{\pi}{2}$

$\therefore \cos^{-1} x = \frac{\pi}{2} - \frac{\pi}{10} = \frac{2\pi}{5}$

5.  $2x - 1 = 3y + 2 = z - 2$

$\Rightarrow 2\left(x - \frac{1}{2}\right) = 3\left(y + \frac{2}{3}\right) = z - 2$

$\Rightarrow \frac{x - \frac{1}{2}}{\frac{1}{2}} = \frac{y + \frac{2}{3}}{\frac{1}{3}} = \frac{z - 2}{1}$

$\Rightarrow \frac{x - \frac{1}{2}}{\frac{1}{2}} = \frac{y + \frac{2}{3}}{\frac{1}{3}} = \frac{z - 2}{1}$

$\therefore$  The direction ratios of the line are 3, 2, 6.

6.  $\int e^x \left(\frac{\sqrt{1-x^2} \cdot \sin^{-1} x + 1}{\sqrt{1-x^2}}\right) dx$

$= \int e^x \left(\sin^{-1} x + \frac{1}{\sqrt{1-x^2}}\right) dx$

$= e^x \sin^{-1} x + c$

7.  $7xy - 7x - 7y - 2 = 0$

$\Rightarrow y(7x - 7) = 7x + 2$

$\Rightarrow y = \frac{7x+2}{7x-7}$

$\therefore$  Required area  $= \int_2^3 y dx = \int_2^3 \frac{7x+2}{7x-7} dx$

$= \left[x + \frac{9}{7} \log(7x-7)\right]_2^3$

$= 1 + \frac{9}{7} \log 2$  sq. units

8.  $\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$

$= \cos^{-1}\left\{\cos\left(\pi + \frac{\pi}{3}\right)\right\}$

$= \cos^{-1}\left(-\cos\frac{\pi}{3}\right)$

$= \pi - \cos^{-1}\left(\cos\frac{\pi}{3}\right) \dots [\because \cos^{-1}(-x) = \pi - \cos^{-1} x]$

$= \pi - \frac{\pi}{3} = \frac{2\pi}{3}$

9.  $A(\text{adj}A) = A(A^{-1}|A|) \dots [\because A^{-1} = \frac{\text{adj}A}{|A|}]$

$= (AA^{-1}) |A|$

$= 2I$

$\therefore A(\text{adj}A) = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

10. Volume of tetrahedron  $= \frac{1}{6} [\overline{AB} \overline{AC} \overline{AD}]$

$\overline{AB} = 2\hat{i} - 9\hat{j} - \hat{k}, \overline{AC} = -7\hat{i} - 2\hat{j} + 2\hat{k},$

$\overline{AD} = -2\hat{i} - 5\hat{j} - \hat{k}$

$\therefore [\overline{AB} \overline{AC} \overline{AD}] = \begin{vmatrix} 2 & -9 & -1 \\ -7 & -2 & 2 \\ -2 & -5 & -1 \end{vmatrix}$

$= 2(2 + 10) + 9(7 + 4) - 1(35 - 4) = 92$





$$\begin{aligned}\therefore \text{Volume of tetrahedron} &= \frac{1}{6} (92) \\ &= \frac{46}{3} \text{ cubic units}\end{aligned}$$

$$\begin{aligned}11. \int \frac{\cos x + x \sin x}{x(x + \cos x)} dx &= \int \frac{(x + \cos x) - (x - x \sin x)}{x(x + \cos x)} dx \\ &= \int \frac{x + \cos x}{x(x + \cos x)} dx - \int \frac{x(1 - \sin x)}{x(x + \cos x)} dx \\ &= \int \frac{dx}{x} - \int \frac{1 - \sin x}{x + \cos x} dx \\ &= \log |x| - \log |x + \cos x| + c \\ &\quad \dots \left[ \because \int \frac{f'(x)}{f(x)} dx = \log |f(x)| + c \right] \\ &= \log \left| \frac{x}{x + \cos x} \right| + c\end{aligned}$$

$$\begin{aligned}12. \text{ Let } I &= \int_0^{\frac{\pi}{4}} \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx \\ \text{Put } \tan x &= t \Rightarrow \sec^2 x dx = dt \\ \therefore I &= \int_0^1 \frac{dt}{(1+t)(2+t)} \\ &= \int_0^1 \left[ \left( \frac{1}{1+t} \right) - \left( \frac{1}{2+t} \right) \right] dt \\ &= [\log |1+t|]_0^1 - [\log |2+t|]_0^1 \\ &= (\log 2 - \log 1) - (\log 3 - \log 2) \\ &= \log 2 - \log \left( \frac{3}{2} \right) \\ \therefore I &= \log \left( \frac{4}{3} \right)\end{aligned}$$

$$\begin{aligned}13. \tan (45^\circ + 12^\circ) &= \frac{\tan 45^\circ + \tan 12^\circ}{1 - \tan 45^\circ \tan 12^\circ} \\ \Rightarrow \tan 57^\circ &= \frac{1 + \tan 12^\circ}{1 - \tan 12^\circ} \\ \Rightarrow \tan 57^\circ - \tan 57^\circ \tan 12^\circ &= 1 + \tan 12^\circ \\ \Rightarrow \tan 57^\circ - \tan 12^\circ - \tan 57^\circ \tan 12^\circ &= 1 = \tan 45^\circ\end{aligned}$$

14. Let the XZ plane divides the line segment joining the given points in the ratio  $k : 1$  at the point  $P(x, y, z)$ .

$$\begin{aligned}\therefore x &= \frac{ka + 3}{k + 1}, y = \frac{-4k + 2}{k + 1} \\ z &= \frac{3k + b}{k + 1}\end{aligned}$$

Since  $P(x, y, z)$  lie on the XZ plane, its  $y$  co-ordinate will be zero.

$$\begin{aligned}\therefore 0 &= \frac{-4k + 2}{k + 1} \\ \Rightarrow -4k + 2 &= 0 \\ \Rightarrow k &= \frac{1}{2}\end{aligned}$$

$$\therefore k : 1 = 1 : 2$$

$$\begin{aligned}15. (\bar{a} + 2\bar{b} - \bar{c}) \cdot [(\bar{a} - \bar{b}) \times (\bar{a} - \bar{b} - \bar{c})] &= (\bar{a} + 2\bar{b} - \bar{c}) \cdot (\bar{a} \times \bar{a} - \bar{a} \times \bar{b} - \bar{a} \times \bar{c} - \bar{b} \times \bar{a} + \bar{b} \times \bar{b} + \bar{b} \times \bar{c}) \\ &= (\bar{a} + 2\bar{b} - \bar{c}) \cdot \{ \bar{b} \times \bar{a} - \bar{a} \times \bar{c} - \bar{b} \times \bar{a} + \bar{b} \times \bar{c} \} \\ &= (\bar{a} + 2\bar{b} - \bar{c}) \cdot \{ -\bar{a} \times \bar{c} + \bar{b} \times \bar{c} \} \\ &= [\bar{a} \ \bar{b} \ \bar{c}] - 2[\bar{b} \ \bar{a} \ \bar{c}] \\ &= [\bar{a} \ \bar{b} \ \bar{c}] + 2[\bar{a} \ \bar{b} \ \bar{c}] \\ &= 3[\bar{a} \ \bar{b} \ \bar{c}]\end{aligned}$$

$$\therefore k = 3$$

$$\begin{aligned}16. a(\cos^2 B + \cos^2 C) + \cos A (c \cos C + b \cos B) &= a \cos^2 B + a \cos^2 C + c \cos A \cos C + b \cos A \cos B \\ &= \cos B (a \cos B + b \cos A) \\ &\quad + \cos C (a \cos C + c \cos A) \\ &= c \cos B + b \cos C \quad \dots [\text{by projection rule}] \\ &= a \quad \dots [\text{by projection rule}]\end{aligned}$$

17. According to the given condition,  
 $m_1 = m_2 + 6 \quad \dots (i)$

Comparing  $kx^2 + 8xy + y^2 = 0$  with  
 $ax^2 + 2hxy + by^2 = 0$ , we get  
 $a = k, 2h = 8, b = 1$

$$\text{Since, } m_1 + m_2 = \frac{-2h}{b} = -8 \quad \dots (ii)$$

$$\text{and } m_1 \cdot m_2 = \frac{a}{b} = k \quad \dots (iii)$$

$$\therefore m_2 + 6 + m_2 = -8 \quad \dots [\text{From (i) and (ii)}]$$

$$\Rightarrow 2m_2 = -14$$

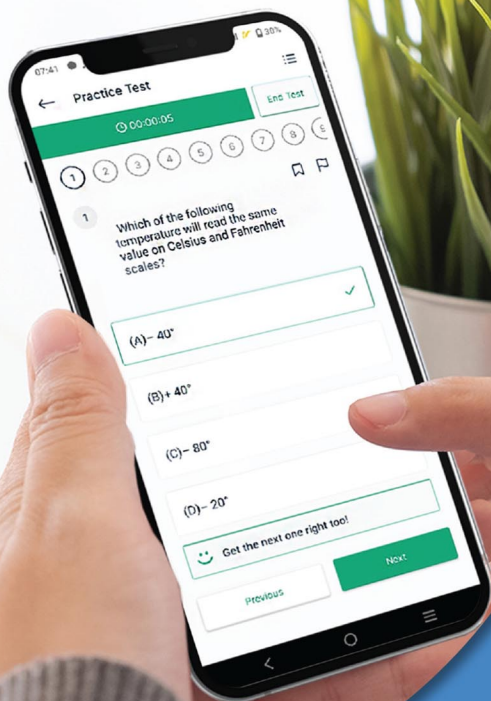
$$\Rightarrow m_2 = -7$$

$$\text{and } (m_2 + 6)m_2 = k \quad \dots [\text{From (i) and (iii)}]$$

$$\therefore (-7 + 6)(-7) = k$$

$$\Rightarrow k = 7$$

$$\begin{aligned}18. \int \frac{1}{\sin x \cdot \cos x} dx &= \int \frac{\sin^2 x + \cos^2 x}{\sin x \cdot \cos x} dx \\ &= \int \left[ \frac{\sin^2 x}{\sin x \cos x} + \frac{\cos^2 x}{\sin x \cos x} \right] dx \\ &= \int (\tan x + \cot x) dx \\ &= \log |\sec x| + \log |\sin x| + c \\ &= \log |\sec x \times \sin x| + c \\ &= \log |\tan x| + c\end{aligned}$$



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