FIITJEE Talent Reward Exam

for student presently in
Class 11

PAPER–2

Time: 3 Hours　　　　　　　　　　　　　　　　　　　　　*Maximum Marks: 270*

Instructions:

> **Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.**
>
> 1. **You are advised to devote 1 Hour on Section-I and 2 Hours on Section-II and Section-III.**
>
> 2. This Question paper consists of 3 sections. **All questions will be multiple choice single correct out of four choices with marking scheme in table below:**

Section			Question no.	Marking Scheme for each question	
				correct answers	**wrong answers**
SECTION – I (IQ)			Q. 1 to 8	**+3**	**–1**
			Q. 9 to 16	**+6**	**–2**
SECTION – II (PCM)	Part –A	Physics	Q. 17 to 25	**+4**	**–1**
	Part –B	Chemistry	Q. 26 to 34	**+4**	**–1**
	Part –C	Mathematics	Q. 35 to 43	**+4**	**–1**
SECTION – III (PCM)	Part –A	Physics	Q. 44 to 48	**+6**	**–2**
	Part –B	Chemistry	Q. 49 to 53	**+6**	**–2**
	Part –C	Mathematics	Q. 54 to 58	**+6**	**–2**

> 3. Answers have to be marked on the OMR sheet.
>
> 4. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.
>
> 5. Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.
>
> 6. **Before attempting paper write your Name, Registration number** and **Test Centre** in the space provided at the bottom of this sheet.

Note:

Check all the sheets of this question paper. Please ensure the same SET is marked on header of all the sheets inside as indicated above 'Maximum Marks' of this page. In case SET marked is not the same on all pages, immediately inform the invigilator and CHANGE the Questions paper.

Registration Number : ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name of the Candidate : _____

Test Centre : _____

SECTION – I
I.Q

Directions (1– 4): These questions are based on the following information given below. Five students Abhey, Bhuvan, Chandan, Deepak and Elizabeth got some marks in the exam. Further, it is known that:

- Exactly two students got same marks
- Elizabeth got more than Deepak, but less than Chandan
- Bhuvan got more marks than Chandan
- Abhey got more marks than exactly one person

1. Who among the following got same marks?
   (A) Abhey and Deepak   (B) Chandan and Elizabeth
   (C) Elizabeth and Bhuvan   (D) Elizabeth and Abhey

2. Who got the highest marks?
   (A) Bhuvan   (B) Chandan
   (C) Abhey   (D) Deepak

3. Who got the least marks?
   (A) Bhuvan   (B) Deepak
   (C) Abhey   (D) Chandan

4. How many students got less marks than Chandan?
   (A) 1   (B) 2
   (C) 3   (D) 4

Space For Rough Work

Directions (5– 8): These questions are based on the following information:
A team is to be selected from the six people A, B, C, D, E and F depending on the following criteria.

- If A is selected, B is also selected
- Only if F is not selected, E is also not selected
- Unless D is selected, C is not selected.
- Exactly one between C and A must be selected

5. If C is selected, then who is selected in a team of three people?
   (A) B   (B) E
   (C) F   (D) Either (A) or (B)

6. If E is not selected, then what is the least possible size of the team?
   (A) 1   (B) 2
   (C) 3   (D) 4

7. If B is selected, then what is the maximum possible size of the team?
   (A) 1   (B) 2
   (C) 3   (D) 5

8. Who is not selected in a team of five?
   (A) A   (B) C
   (C) F   (D) Either (A) or (B)

Directions (9 –12): A cube is painted such that one of its face is painted in red, one face is painted in white and one face painted in green. The other three faces are left unpainted. The cube is now cut into 729 small and identical cubes.

9. What is the maximum possible number of small cubes that have all the three colours on them?
   (A) 1   (B) 2
   (C) 4   (D) 5

Space For Rough Work

10.   What is the minimum possible number of small cubes that have both red and white colours on them?
(A) 1   (B) 5
(C) 6   (D) 0

11.   How many small cubes have white colour on them?
(A) 75   (B) 85
(C) 72   (D) 81

12.   What is the minimum possible number of small cubes that have no colour on them?
(A) 343   (B) 512
(C)504   (D) 269

Directions (13 –16): These questions are based on the following information.

Six dishes P, Q, R, S, T and U among which two are main course, two are starters and two are desserts, are arranged in a circular order. P is adjacent to U. R is not adjacent to either Q or T. S is a main course and is adjacent to desserts. Both the starters are adjacent to each other. P is opposite to a dessert, which is not Q.

13.   Which dish is opposite to T?
(A) P   (B) Q
(C) R   (D) S

14.   Which of the following combinations is definitely correct?
(A) Q - dessert   (B) U – main course
(C) U – starter   (D) Q – starter

15.   Which of the following is true?
(A) One of the deserts is opposite to a main course
(B) A main course is opposite to a starter
(C) P is a starter
(D) More than one of the above

16.   Which dishes are adjacent to Q?
(A) P and R   (B) S and U
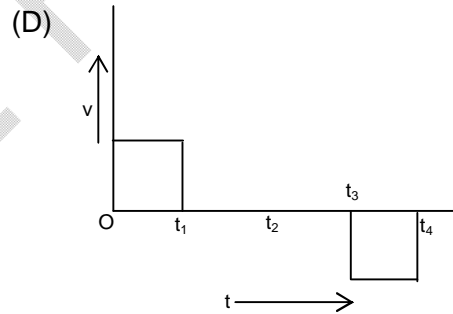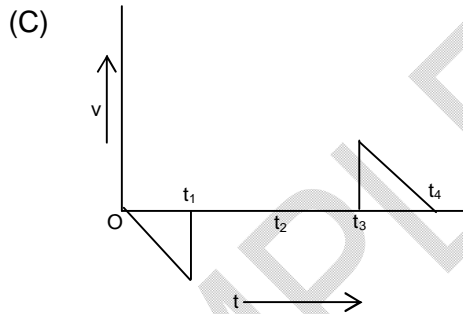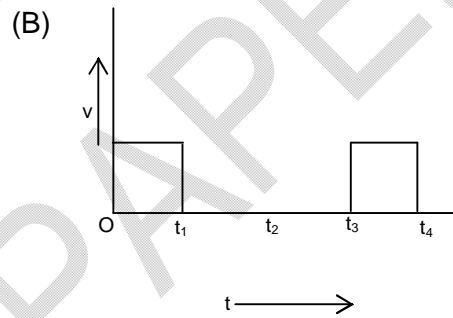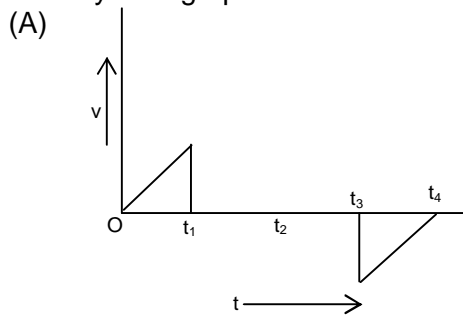(C) T and P   (D) T and U

Space For Rough Work

SECTION – II
PCM

17.   Displacement time graph of a body is shown in the figure
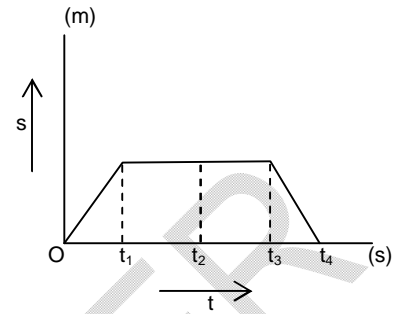
Velocity time graph of the motion of the body will

(A)

(B)

(C)

(D)

Space For Rough Work

18. A particle of mass m is fixed to one end of a light rigid rod of length ℓ and rotated in a vertical circular path about its other end. The minimum speed of particle at its highest point must be :

(A) zero

(B) $\sqrt{gL}$

(C) $\sqrt{1.5\,gL}$

(D) $\sqrt{2gL}$

19. An observer is moving with acceleration a_1 and an object of mass m is moving with acceleration a_2. The pseudo force observed by observer on object of mass m will be :

(A) m $(a_1 - a_2)$ $(-\hat{i})$

(B) m $(a_2 + a_1)$ $(-\hat{i})$

(C) m a_1 $(-\hat{i})$

(D) ma_2 $(-\hat{i})$
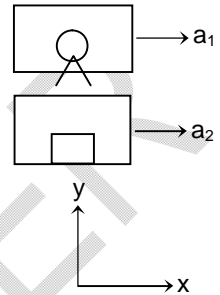
20. A man is standing on a weighing machine with a block in his hand. The machine records W. When he takes the blocks upwards with some acceleration the machine records W_1. When he takes the blocks down with some acceleration, the machine records W_2. Then choose correct option.

(A) $W_1 = W = W_2$

(B) $W_1 < W < W_2$

(C) $W_2 < W < W_1$

(D) $W_2 = W_1 > W$

21. Choose from the following the correct option.
(A) During elastic collision of two bodies the total kinetic energy of the system remains constant.
(B) The total momentum of the system comprising of two colliding bodies remains constant only for elastic collision.
(C) The total momentum of the system comprising of two colliding bodies may remain constant even for inelastic collision.
(D) None of the above.

Space For Rough Work

22. A person takes an aim at a monkey sitting on a tree and fires a bullet. Seeing the smoke the monkey begins to fall freely; then the bullet will
    (A) always hit the monkey
    (B) go above the monkey
    (C) go below the monkey
    (D) hit the monkey if initial velocity of the bullet is more than a certain velocity

23. A particle is connected to a light rod of length R and the rod is fixed at other end with the help of smooth hinge. At lowest point it is given a speed $\sqrt{4gR}$. Graph showing variation of magnitude of internal force in the rod with the angle θ made by the rod from its initial position is

    (A)

    (B)

    (C)

    (D)
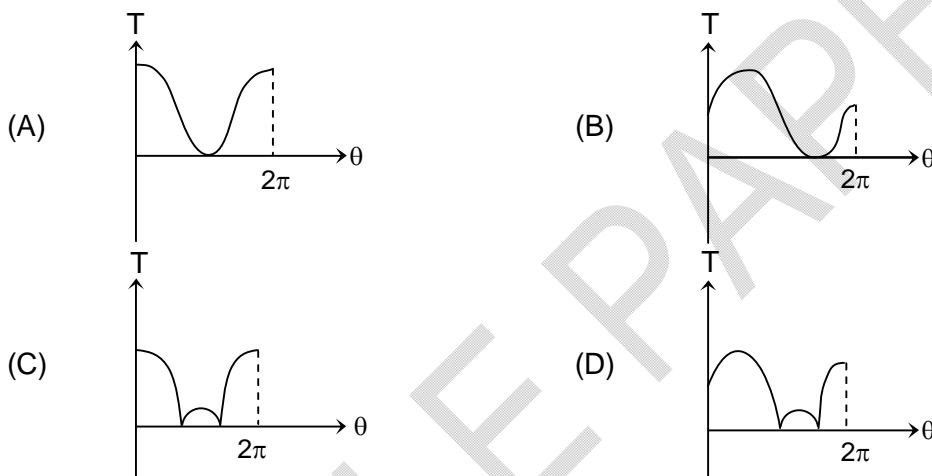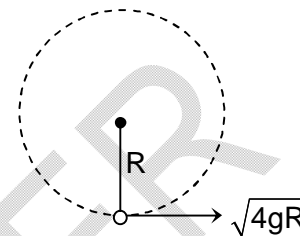
24. A external agent moves the block m slowly from A to B, along a smooth hill such that every time he applies the force tangentially. Find the work done by agent in this interval.
    (A) $\dfrac{m^2g^2H^2}{L}$
    (B) $\dfrac{mgH^2}{L}$
    (C) mg(H+L)
    (D) mgH
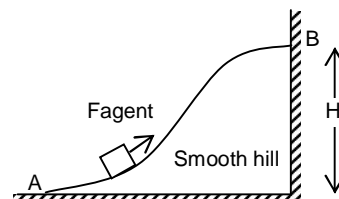
Space For Rough Work

25. A cart moves with a constant speed along a horizontal circular path. From the cart a particle is thrown up vertically with respect to cart.
    (A) The particle will land somewhere on circular path
    (B) The particle will land inside the circular path
    (C) The particle will follow an elliptical path
    (D) The particle will follow a parabolic path.

26. The atomic number of an atom is six. Which of the following statement is correct regarding the atom?
    (A) It contains two electrons in the s-orbitals.
    (B) It attains a half-filled electron configuration by gaining one electron.
    (C) It contains two electrons in the valence shell.
    (D) It forms ionic compound with hydrogen by losing one electron.

27. What is the oxidation number of sodium in Na – Hg amalgam?
    (A) +1   (B) -1
    (C) zero   (D) unpredictable

28. When lime water is exposed to atmosphere for some time, a thin solid layer gets deposited on its surface. The solid layer is due to the formation of
    (A) CaO   (B) Ca_3N_2
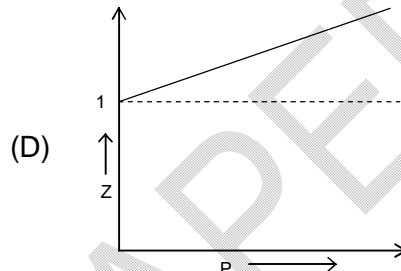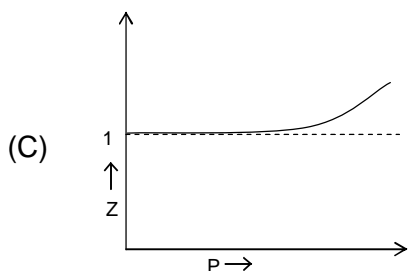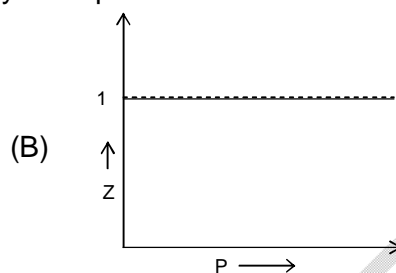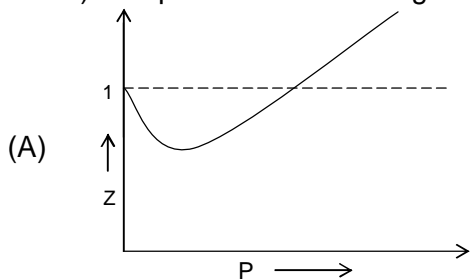   (C) $CaCO_3$ (D) CaC_2

29.
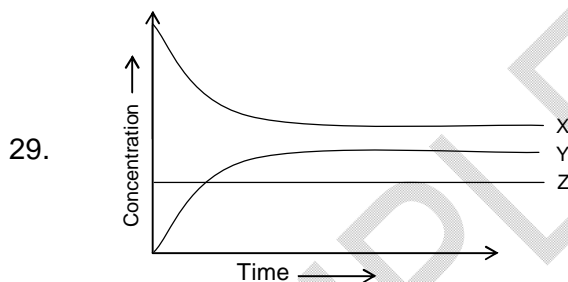
    Which of the following reversible reaction is represented in the above figure?
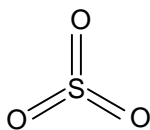   (A) $Y(g) \rightleftharpoons X(g) + Z(g)$ (B) $Y(g) + Z(s) \rightleftharpoons X(g)$
    (C) $X(g) + Z(s) \rightleftharpoons Y(g)$ (D) $X(g) + Z(g) \rightleftharpoons Y(g)$

Space For Rough Work

30. Which of the following figure correctly represents the variation of Z (compressibility factor) with pressure 'P' of nitrogen at its Boyle temperature?

(A)

(B)

(C)

(D)

31.

Which of the following statement is correct about the above molecule?
(A) The hybridization of sulphur is sp^3d^2.
(B) The dipole moment of the molecule is zero
(C) The central atom contains a lone pair
(D) There is no lone pair on oxygen

32. When heated, boric acid H_3BO_3 loses water in steps and finally B_2O_3 is formed. Which intermediate is formed during this dehydration process?
(A) H_2BO_3 (B) $H_2B_2O_7$
(C) HBO_2 (D) $H_2B_2O_3$

Space For Rough Work

33. Which of the following solution pair displays common ion effect?
(A) $NaHS + Na_2SO_4$ (B) $Na_2SO_4 + H_2S$
(C) $NaHS + H_2SO_4$ (D) $Na_2SO_4 + K_2SO_4$

34.
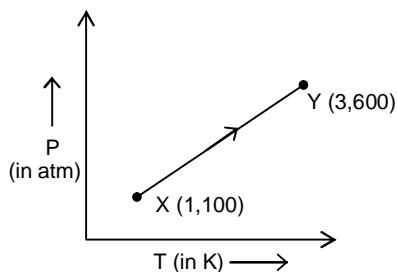
Above graph represents a reversible process $X \rightarrow Y$ of one mole of an ideal gas. The values of pressure and temperature of the systems X and Y are mentioned in the brackets.
In the above process work is done
(A) on the gas by the surrounding
(B) by the gas on the surrounding
(C) neither by system nor by the surrounding
(D) unpredictable

35. The roots x_1 and x_2 of the equation of $x^2 + px + 12 = 0$ are such that $x_1 - x_2 = 1$. Then p =
(A) ± 3 (B) ± 5
(C) ± 7 (D) ± 9

36. The equation to the perpendicular bisector of the line segment joining (1, 2) , (3, 4) is
(A) $2x - y + 5 = 0$ (B) $x + y - 5 = 0$
(C) $3x - 2y + 5 = 0$ (D) $x + y - 4 = 0$
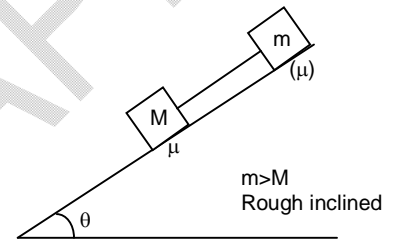
Space For Rough Work

37. If A, B are acute angles, $\sin A = 4/5$, $\tan B = 5/12$, then $\cos(A - B) =$

(A) $\dfrac{63}{65}$ (B) $\dfrac{65}{56}$

(C) $\dfrac{65}{63}$ (D) $\dfrac{56}{65}$

38. If α, β are different values of x satisfying $a\cos x + b\sin x = c$ then $\tan\left(\dfrac{\alpha + \beta}{2}\right) =$

(A) $a + b$ (B) $a - b$

(C) $\dfrac{a}{b}$ (D) $\dfrac{b}{a}$

39. Let f be a linear function for which $f(6) - f(2) = 12$. What is $f(12) - f(2)$?
(A) 12   (B) 18
(C) 24   (D) 30

40. Let $A = (0,9)$ and $B = (0, 12)$ Points A' and B' are on the line $y = x$, and line segments AA' and BB' intersect at $C = (2, 8)$. What is the length of segment A'B'?

(A) 2   (B) $2\sqrt{2}$

(C) 3   (D) $2 + \sqrt{2}$

41. Let a, b, c and d be positive real numbers such that a, b, c, d form an increasing arithmetic sequence and a, b, d form a geometric sequence. What is a/d?

(A) $\dfrac{1}{12}$ (B) $\dfrac{1}{6}$

(C) $\dfrac{1}{4}$ (D) $\dfrac{1}{3}$
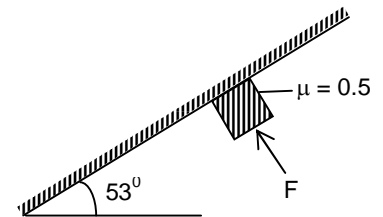
Space For Rough Work

42. Let C_1 and C_2 be circles defined by $(x-10)^2 + y^2 = 36$ and $(x+15)^2 + y^2 = 81$ respectively. What is the length of the shortest line segment PQ that is tangent to C_1 at P and to C_2 at Q?
    (A) 15 (B) 18
    (C) 20 (D) 21

43. For all positive integers n, let $f(n) = \log_{2002} n^2$. Let $N = f(11) + f(13) + f(14)$
    Which of the following relations is true?
    (A) $N < 1$ (B) $N = 1$
    (C) $1 < N < 2$ (D) $N = 2$

SECTION – III
PCM

44. The tension in rope (rope is light) and $\mu < \tan\theta$
    (A) $(M+m)g\sin\theta$
    (B) $(M+m)g\sin\theta - \mu mg\cos\theta$
   (C) zero
    (D) $(M+m)g\cos\theta$

45. In the figure shown the minimum value of F to be applied perpendicular to the inclined so that the block of mass 10 kg does not slides and remains in contact with inclined plane is
    (A) 0 (B) 40 N
    (C) 220 N (D) 200 N

Space For Rough Work

46. Velocity of point A on the rod is 2 m/s (leftward) at the instant shown in the figure. The velocity of the point B on the rod at its instant is

    (A) $\dfrac{2}{\sqrt{3}}$ m/s

    (B) 1 m/s

    (C) $\dfrac{1}{2\sqrt{3}}$ m/s

    (D) $\dfrac{\sqrt{3}}{2}$ m/s
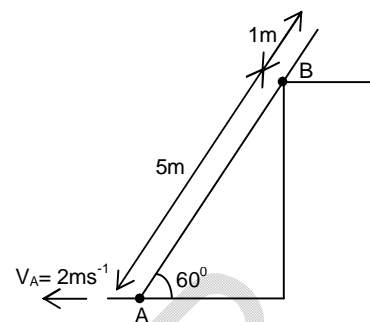
47. Two particles A and B are projected simultaneously from the same point as shown in the figure. The magnitude of their relative velocity when their velocities are mutually perpendicular is
    (A) 35 m/s
    (B) 5 m/s
    (C) $\sqrt{1425}$ m/s
    (D) None of the above

48. Consider the given diagram. The drum of radius R is rotating with constant angular velocity ω in such sense that string is winding on the drum. The platform on which drum is fixed is moving with uniform velocity V. The correct relation between V and ω is

    (A) $V = \omega R$

    (B) $V = \dfrac{\omega R}{2}$

    (C) $V = 2\omega R$

    (D) $V = \dfrac{\omega R}{4}$
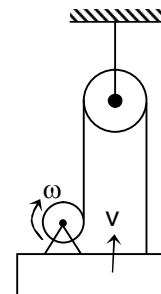
49. The penultimate and valence shell electronic configuration of a d – block element (M) is $ns^2np^6nd^x$ (n + 1)s^2. The magnetic moment of its trivalent chloride (MCl_3) is $2\sqrt{6}$ B.M. What should be the value of 'x' (the no. of d-electrons present in its penultimate orbit)? [Assume MCl_3 as an ionic compound]
    (A) only 7
    (B) 4 or 6
    (C) only 5
    (D) 5 or 7

Space For Rough Work

50. Which of the following molecule contains the largest $\angle ONO$ bond angle?
(A) KNO_2 (B) NO_2BF_4
(C) $NaNO_3$ (D) NO_2

51. What is the pH of a one litre solution which contains 80 g of $KHCO_3$ and 55.2 g of K_2CO_3?
[Given $K_{a_1} (H_2CO_3) = 4 \times 10^{-7}$ and $K_{a_2} (H_2CO_3) = 4 \times 10^{-11}$]
(At. wt of K = 39, log 2 = 0.3010)
(A) 10.801   (B) 10.416
(C) 10.097   (D) 10.612

52. 2.6 g sample of pyrolusite which contains MnO_2 was boiled with 65 mL of N oxalic acid and excess of dil.H_2SO_4. The liquid was then filtered and the residue washed. The filtrate and the washing were mixed and made upto 500 mL. 100 mL of this solution required 50 mL of $\dfrac{N}{10}$ $KMnO_4$. What is the % (mass - mass) of MnO_2 in the sample?
(A) 78.3%   (B) 34.08%
(C) 66.92%   (D) 71.2%

53.
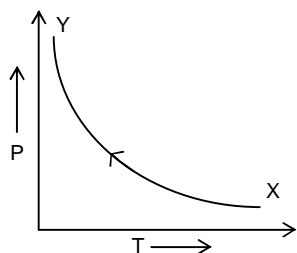
Which of the following statement is correct regarding one mole of an ideal gas undergoing the above process $X \to Y$?
(I) RMS speed of gas molecules increases during the process $X \to Y$.
(II) Density of gas increases during the process $X \to Y$.
(III) Entropy of the gas increases during the process $X \to Y$.
(IV) Kinetic energy increases during the process $X \to Y$.
(V) Deviation from ideal behaviour increases during the process $X \to Y$.
Choose the correct codes:
(A) III and V   (B) III, IV and V
(C) I, II and V   (D) II and V

Space For Rough Work

54. In triangle ABC, if $9BC^2 + 9CA^2 - 19AB^2 = 0$, What is the value of $\dfrac{\cot C}{\cot A + \cot B}$?

    (A) $\dfrac{5}{9}$ (B) $\dfrac{4}{9}$

    (C) $\dfrac{6}{9}$ (D) $\dfrac{2}{9}$

55. Let S be the set of point (a, b) in the coordinate plane, where each of a and b may be −1, 0 or 1. How many distinct lines pass through at least two members of S?
    (A) 8   (B) 20
    (C) 24   (D) 27

56. A circle having centre (0, k), with $k > 6$, is tangent to the line $y = x$, $y = -x$ and $y = 6$. What is the radius of this circle?

    (A) $6\sqrt{2} - 6$ (B) 6

    (C) $6\sqrt{2}$ (D) $6 + 6\sqrt{2}$

57. For each positive integer n, the parabola $y = (n^2 + n)x^2 - (2n+1)x + 1$ cuts the x − axis at the points A_n and B_n. What is the value of $\displaystyle\sum_{n=1}^{1992} A_n B_n$?

    (A) $\dfrac{1991}{1992}$ (B) $\dfrac{1992}{1993}$

    (C) $\dfrac{1991}{1993}$ (D) $\dfrac{1993}{1992}$

58. In the sequence $\{a_n\}$, $a_1 = a_2 = 1$ and $a_3 = 2$. For $n \geq 1$, $a_n a_{n+1} a_{n+2} \neq 1$ and

    $a_n a_{n+1} a_{n+2} a_{n+3} = a_n + a_{n+1} + a_{n+2} + a_{n+3}$.

    What is the value of $\displaystyle\sum_{n=1}^{100} a_n$?

    (A) 200   (B) 300
    (C) 400   (D) 500

Space For Rough Work

FIITJEE **Talent Reward Exam**

Class 11
PAPER-2
ANSWERS

SECTION – I
I.Q

1.	**D**	2.	**A**	3.	**B**	4.	**C**
5.	**D**	6.	**B**	7.	**D**	8.	**D**
9.	**A**	10.	**D**	11.	**D**	12.	**C**
13.	**A**	14.	**C**	15.	**D**	16.	**D**

SECTION – II
PCM

17.	**D**	18.	**A**	19.	**C**	20.	**C**
21.	**C**	22.	**D**	23.	**C**	.24.	**D**
25.	**D**	26.	**B**	27.	**C**	28.	**C**
29.	**C**	30.	**C**	31.	**B**	32.	**C**
33.	**C**	34.	**B**	35.	**C**	36.	**B**
37.	**D**	38.	**D**	39.	**D**	40.	**B**
41.	**C**	42.	**C**	43.	**D**		

SECTION – III
PCM

44.	**C**	45.	**C**	46.	**B**	47.	**A**
48.	**B**	49.	**D**	50.	**B**	51.	**C**
52.	**C**	53.	**D**	54.	**A**	55.	**B**
56.	**D**	57.	**B**	58.	**A**		