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Time: 3 Hours   **M.M. 300**

ALL INDIA SKY TEST SERIES

XI – IIT JEE (SAMARATH BATCH)

Date: 20/08/2023

SYLLABUS

PHYSICS	CHEMISTRY	MATHEMATICS
One Dimension Motion, Projectile Motion	Atomic Structure, Redox, Periodic Table	Set theory, Relation, Progression

Please read the instructions carefully. You are allotted **5** minutes specifically for this purpose.

INSTRUCTIONS:

1. This Question paper is divided in to three parts Physics, Chemistry and Mathematics each part is further divided into two sections.
   Section –A Contains 20 Questions Section B contains 10 questions. Please ensure that the Questions paper you have received contains **ALL THE QUESTIONS** in each Part.
2. **In Section A all the 20 Questions are compulsory and Section B Contain 10 Question, out of these 10 Questions**, candidates can choose to attempt any 5 Questions.
   Each Question has four choices (A), (B), (C), (D) out of which **only one is correct & Carry 4 marks each 1 mark** will be deducted for each wrong answer.

GENERAL INSTRUCTION

1. Use only **blue/black pen (avoid gel pen)** for darkening the bubble.
2. Indicate the correct answer for each question by filling appropriate bubble in your **OMR** answer sheet.
3. The answer sheet will be checked through computer hence, the answer of the question must be marked by –shading the circles against the question by dark **blue/black pen**
4. Blank papers, Clipboards, Log tables, Slide Rule, Calculator, Cellular Phones Papers and Electronic Gadgets in any form are **not** allowed to be carried inside the examination hall.
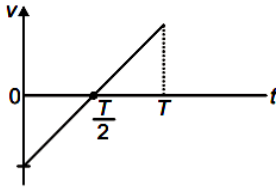
Name of the candidate:_____

Signature of the candidate: _____Signature of the invigilator: _____

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# PHYSICS

Section - A

Single Choice Question

1. Which of the following conclusions can be drawn on the basis of velocity (v) - time (t) graph shown for a particle moving along x-axis?

   (a) Distance covered by a particle is zero
   (b) Displacement of the particle is zero
   (c) Acceleration of a particle is zero
   (d) All of these

2. A balloon carrying a stone is moving upward with a constant speed 10 m/s. When balloon is at height 75 m, the stone is dropped. The time taken by the stone to reach the ground after release is (g = 10 m/s²)

   (a) 4 s   (b) $\sqrt{15}$ s   (c) 5 s   (d) 6 s

3. A policeman is moving with constant speed on a straight road. When he is at distance 250 m behind a car, the car starts accelerating from rest and move with a constant acceleration 2 m/s² . The minimum speed of the policeman such that he can catch the car is

   (a) 10 m/s   (b) $10\sqrt{5}$ m/s
   (c) $10\sqrt{10}$ m/s   (d) $10\sqrt{2}$ m/s

4. A particle is projected at an angle 30° with the horizontal with speed 20 m/s. How high will it strike a wall $8\sqrt{3}$ m away from point of projection? (g = 10 m/s²)
   (a) 5 m   (b) 4.8 m   (c) 2.4 m   (d) 9.6 m

5. The speed at the maximum height of a projectile is half of its initial speed of projection (u). The horizontal range of the projectile is

   (a) $\dfrac{\sqrt{3}u^2}{2g}$ (b)   (c) $\dfrac{u^2}{\sqrt{3}g}$ (d) $\dfrac{2u^2}{\sqrt{3}g}$

6. A bird is flying to and fro between two cars A and B moving towards each other on a straight road with speed 18 km/h and 36 km/h respectively. The bird starts moving from car A towards car B, when the two cars were separated by 54 km. The displacement of bird till two cars meet is (Neglect dimensions of car)
   (a) 54 km   (b) 18 km
   (c) 36 km   (d) Data insufficient

7. A ball is thrown vertically down from a certain height with some speed. After rebound with ground it is caught at the same point with same speed at which it was thrown. Its velocity-time (v-t) graph (Taking vertically downward direction as positive) is best represented by

   (a)   (b)

   (c)   (d)
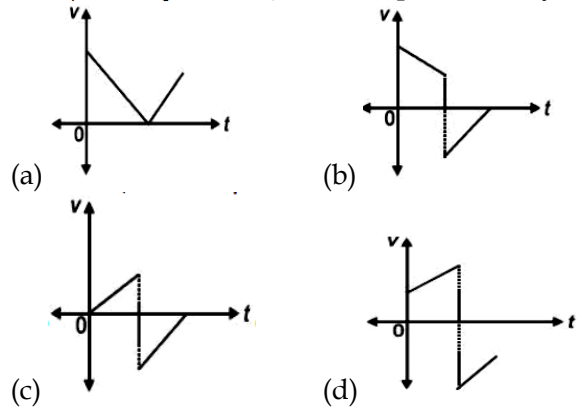
8. A fighter plane is flying horizontally at an altitude of 2000 m with speed 720 km/h. At a particular angle of sight (with respect to horizontal) when target is seen, the pilot drops a bomb in order to attack the target. This angle is
   (a) tan⁻¹(1/2)   (b) tan⁻¹(a)
   (c) tan⁻¹(1/4)   (d) tan⁻¹(b)

9. A particle is projected with a velocity v such that its range on the horizontal plane is twice the greatest height attained by it. The range of the projectile is (where g is acceleration due to gravity)

   (a) $\dfrac{4v^2}{5g}$ (b) $\dfrac{4g}{5v^2}$ (c) $\dfrac{v^2}{g}$ (d) $\dfrac{4v^2}{\sqrt{5}g}$

10. When a ball is projected at some angle θ with the horizontal, it has range R and time of flight t_1 . If same ball is projected with same speed at an angle θ with the vertical, its time of flight is t_2 . Then

   (a) $t_1 + t_2 = \dfrac{2R}{g}$ (b) $t_1 t_2 = \dfrac{2R}{g}$

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(c) $t_1 - t_2 = \dfrac{R}{g}$ 　　　(d) $t_1 t_2 = \dfrac{R}{g}$

11. A person takes T_1 second to move up a certain distance on the stationary escalator. While moving up on a moving escalator, the person takes T_2 second to cover same distance. The time taken to cover the same distance if man just stands on the moving escalator is.

(a) $T_1^2 - T_2^2$ 　　　(b) $\dfrac{T_2 T_1}{T_2 + T_1}$

(c) $\dfrac{T_2 T_1}{T_1 - T_2}$ 　　　(d) $\dfrac{T_2 + T_1}{2}$

12. A body is projected with velocity 20 ms⁻¹ at an angle 60° with the horizontal. The velocity of body at instant it is making an angle 45° with the horizontal is
(a) 10 ms⁻¹ 　　　(b) 14.14 ms⁻¹
(c) 28.28 ms⁻¹ 　　　(d) $20\sqrt{3}$ ms⁻¹

13. Two particles are projected simultaneously in the same vertical plane from the same point, but with different speeds and at different angles to the horizontal. The path of one particle with respect to other is
(a) Straight line 　　　(b) Parabola
(c) Ellipse 　　　(d) Circle

14. The equation of trajectory of a projectile projected from origin is given as $y = 2x - \dfrac{x^2}{2}$. The maximum height of projectile from origin is (Symbols have usual meanings and are in SI unit)
(a) 4 m 　　(b) 1 m 　　(c) 2 m 　　(d) 10 m

15. Let $\vec{v}$ and $\vec{a}$ denote the velocity and acceleration respectively of a body in one dimension motion. Then correct option is.
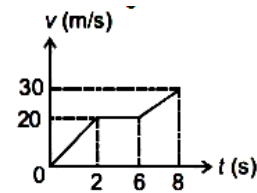(a) $|\vec{V}|$ must decrease when $\vec{a} < 0$
(b) speed must increase when
(c) Speed will decrease when $\vec{v} < 0$ and $\vec{a} > 0$
(d) All of these

16. Figure given below shows the graph of velocity v of particle moving along x-axis as a function of time t. Average acceleration during t = 1 s to t = 7 s is

(a) 1.5 m/s² 　　　(b) 1 m/s²
(c) 2 m/s² 　　　(d) 2.5 m/s²

17. The length of seconds hand of a watch is 1 cm. The change in velocity of its tip in 15 second (in cm/s) is

(a) Zero 　(b) $\dfrac{\pi}{30\sqrt{2}}$ 　(b) $\dfrac{\pi}{30}$ 　(d) $\dfrac{2\pi}{30\sqrt{2}}$

18. A cricket ball of mass 100 g has an initial velocity $\vec{u} = \left(2\hat{i} + 3\hat{j}\right)$ m/s and a final velocity $\vec{v} = -\left(2\hat{i} + 3\hat{j}\right)$ m/s after being hit by bat. The change in momentum (in kg m/s) of the ball is.
(a) $-\left(0.9\hat{i} + 1.2\hat{j}\right)$ 　　　(b) $-\left(0.4\hat{i} + 0.6\hat{j}\right)$
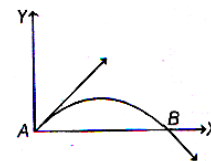(c) $-\left(4\hat{i} + 6\hat{j}\right)$ 　　　(d) Zero

19. Two projectiles are fired with same speed but at different angles. Their trajectories are shown in the following figure. Find the ratio of their horizontal velocity.
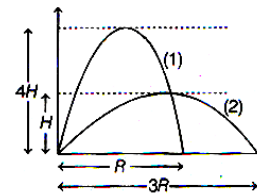
(a) $\dfrac{u_{x_1}}{u_{x_2}} = \dfrac{1}{3}$ 　　　(b) $\dfrac{u_{x_1}}{u_{x_2}} = \dfrac{3}{1}$

(c) $\dfrac{u_{x_1}}{u_{x_2}} = \dfrac{1}{6}$ 　　　(d) $\dfrac{u_{x_1}}{u_{x_2}} = \dfrac{3}{2}$

20. The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j})$ m/s. Its velocity (in m/s) at point B is


(a) $(-2\hat{i} - 3\hat{j})$ 　　　(b) $(-2\hat{i} + 3\hat{j})$
(c) $(2\hat{i} - 3\hat{j})$ 　　　(d) $(2\hat{i} + 3\hat{j})$

Section - B

Integer Type Questions

21. A particle moves for the first one third of the total time of journey with speed 30 km/h and with speed 15 km/h for the remaining time. Average speed during total journey (in km/h) is……….

22. A ball is dropped from the roof of a tower of height h. The total distance covered by it in the last second of its motion is equal to the distance covered by it in first three seconds. The value of $\frac{h}{5}$ in meters is (g = 10 m/s²) ……….

23. If a particle moves in a straight line such that its position varies with time as $x = 5(t-2)+6(t-2)^2$, then initial acceleration (in m/s²) is (Assume all quantities in SI units)

24. Acceleration of a particle moving in a straight line is varying with time as $a = (6t^2 + 4t + 2)$ m/s². Initial velocity of particle is 5 m/s. Find the velocity at time t = 1 s in m/s.

25. Two balls are thrown horizontally from a 80 m high tower in same direction with velocities 2 m/s and 3 m/s respectively. The separation (in m) between the two balls when they hit the ground is (g = 10 m/s²)……….

26. A particle is moving on a straight line such that its velocity is given by $v = 6t + 3t^2$, where v is in m/ s and t is in second. If at t = 0, the particle is at origin then average velocity (in m/s) during t = 0 to t = 3 s is…….

27. An object is thrown at an angle of θ with horizontal. If elevation angle of the object at its highest point as seen from the point of projection is $\tan^{-1}\left(\frac{1}{2}\right)$, then θ (in degree) is equal to.

28. A boy can throw a stone upto a maximum height of 10 m. The maximum horizontal distance upto which the boy can throw the same stone is……..

29. The diagram shows the position – time graph for a particle moving in a straight line. The average velocity for the interval from t = 0 to t = 5 s is $-x$ m/sec. Find x
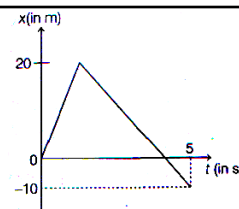
30. A particle is projected from a horizontal plane (x-z plane) such that its velocity vector at time t is given by
$$\vec{v} = a\hat{i} + (b-ct)\hat{j}$$
Its range on the horizontal plane is given by $\frac{nba}{c}$. Find n

CHEMISTRY

Section - A

Single Choice Question

31. Which of the following reactions is not an example of disproportionation reaction?
(a) $2H_2O_2 \rightarrow 2H_2O + O_2$
(b) $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$
(c) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$
(d) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

32. The redox reaction among the following is
(a) combination of dinitrogen with dioxygen at 2000 K
(b) formation of ozone from atmospheric oxygen in the presence of sunlight
(c) reaction of H_2SO_4 with NaOH
(d) reaction of $[Co(H_2O)_6]Cl_3$ with $AgNO_3$.

33. Identify the process in which change in the oxidation state is five.
(a) $C_2O_4^{2-} \rightarrow 2CO_2$　　(b) $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$
(c) $CrO_4^{2-} \rightarrow Cr^{3+}$　　(d) $MnO_4^- \rightarrow Mn^{2+}$

34. Match List-I with List –II.

	List-I (Colloid Preparation Method)		List-II (Chemical Reaction)
(A)	Hydrolysis	(i)	$2AuCl_3 + 3HCHO + 3H_2O \rightarrow 2Au(sol) + 3HCOOH + 6HCl$
(B)	Reduction	(ii)	$As_2O_3 + 3H_2S \rightarrow As_2S_3 (sol) + 3H_2O$
(C)	Oxidation	(iii)	$SO_2 + 2H_2S \rightarrow 3S(sol) + 2H_2O$
(D)	Double decomposition	(iv)	$FeCl_3 + 3H_2O \rightarrow Fe(OH)_3 (sol) + 3HCl$

Choose the most appropriate answer from the options given below.
(a) (A)-(i), (B)-(iii), (C)-(ii), (D)-(iv)
(b) (A)-(iv), (B)-(i), (C)-(iii), (D)-(ii)
(c) (A)-(i), (B)-(ii), (C)-(iv), (D)-(iii)
(d) (A)-(iv), (B)-(ii), (C)-(iii), (D)-(i)

35. In which of the following reactions, hydrogen peroxide acts as an oxidizing agent?
(a) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$
(b) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$
(c) $2MnO_4^- + 3H_2O_2 \rightarrow 2MnO_2 +$
$3O_2 + 2H_2O + 2OH^-$
(d) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$

36. Consider the following reaction,
$xMnO_4^- + yC_2O_4^{2-} + 2H^+ \rightarrow$
$xMn^{2+} + 2yCO_2 + \dfrac{z}{2}H_2O$
The values of x, y and z in the reaction are, respectively
(a) 5, 2 and 8　　　　(b) 5, 2 and 16
(c) 2, 5 and 8　　　　(d) 2, 5 and 16

37. If the radius of 3rd Bohr's orbit of hydrogen atom is r_3 and the radius of 4th Bohr's orbit is r_4, then
(a) $r_4 = \dfrac{9}{16}r_3$　　　　(b) $r_4 = \dfrac{16}{9}r_3$
(c) $r_4 = \dfrac{3}{4}r_3$　　　　(d) $r_4 = \dfrac{4}{3}r_3$

38. If the Thomson model of the atom was correct, then the result of Rutherford's gold foil experiment would have been,
(a) $\alpha-$particles pass through the gold foil deflected by small angles and with reduced speed.
(b) $\alpha-$particles are deflected over a wide range of angles.
(c) All $\alpha-$particles get bounced back by 180^0
(d) All of the $\alpha-$particles pass through the gold foil without decrease in speed.

39. Given below are two statements.
Statement-I : Rutherford's gold foil experiment cannot explain the line spectrum of hydrogen atom.
Statement II : Bohr's model of hydrogen atom contradicts Heisenberg's uncertainty principle.
(a) Both statement-I and statement-II are true.
(b) Statement-I is false but statement-II is true.

(c) both statement – I and statement –II are false.
(d) Statement-I is true but statement-II is false.

40. The number of orbitals associated with quantum numbers n = 5, $m_s = +\dfrac{1}{2}$ is
(a) 25　　(b) 11　　(c) 15　　(d) 50

41. Mole fraction of NaOH in 10% W/W NaOH (aq.) solution is
(a) $\dfrac{20}{21}$　　(b) $\dfrac{5}{9}$　　(c) $\dfrac{1}{21}$　　(d) 0.75

42. Number of electron deficient molecules among the following
PH_3, B_2H_6, CCl_4, NH_3, LiH and BCl_3 is
(a) 0　　(b)1　　(c) 2　　(d) 3

43. Which have higher electron affinity
(a) F　　(b) Br　　(c) Cl　　(d) O

44. The IUPAC nomenclature of an element with electronic configuration [Rn] $5f^{14}$ $6d^1$ $7s^2$ is
(a) Unnilbium　　　　(b) Unnilunium
(c) Unnilquadium　　(d) Unniltrium

45. The set that contains atomic numbers of only transition elements, is
(a) 37, 42, 50, 64　　(b) 21, 25, 42, 72
(c) 9, 17, 34, 38　　(d) 21, 32, 53, 64

46. The characteristics of element X, Y and Z with atomic numbers respectively, 33, 53 and 83 are
(a) X is a metalloid, Y is a non-metal and Z is a metal
(b) X, Y and Z are metals
(c) X and Y are metalloids and Z is a metal
(d) X and Z are non-metals and Y is a metalloid.

47. Consider the hypothetical situation where the azimuthal quantum number, l, takes values 0, 1, 2, ……n + 1, where n is the principal quantum number. Then, the element with atomic number
(a) 9 is the first alkali metal
(b) 13 has a half-filled valence subshell
(c) 8 is the first noble gas
(d) 6 has a 2p-valence subshell.

48. The correct order of increasing ionic radii is
(a) $Mg^{2+} < Na^+ < F^- < O^{2-} < N^{3-}$
(b) $N^{3-} < O^{2-} < F^- < Na^+ < Mg^{2+}$
(c) $F^- < Na^+ < O^{2-} < Mg^{2+} < N^{3-}$
(d) $Na^+ < F^- < Mg^{2+} < O^{2-} < N^{3-}$

49. Identify the elements X and Y using ionization energy values given below:
Ionization energy (kJ/mol):

	Iˢᵗ	2ⁿᵈ
X	495	4563
Y	731	1450

(a) X = Mg; Y = Na   (b) X = Mg; Y = F
(c) X = Na ; Y = Mg   (d) X = F; Y = Mg

50. The correct order of atomic radii is
(a) Ce > Eu > Ho > N
(b) Ho > N > Eu > Ce
(c) Eu > Ce > Ho > N
(d) N > Ce > Eu > Ho

Section - B

Integer Type Questions

51. When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{2-}$, MnO_2, Mn_2O_3, Mn^{2+} then the total number of electrons transferred in all case is

52. The volume, in mL of 0.02 M $K_2Cr_2O_7$ solution required to react with 0.288 g of ferrous oxalate in acidic medium is _____.
(Molar mass of Fe = 56 g mol⁻¹)

53. Consider the following set of quantum numbers

	n	l	m_1
A.	3	3	-3
B.	3	2	-2
C.	2	1	+1
D.	2	2	+2

The number of correct sets of quantum numbers is _____.

54. A certain orbital has n = 4 and m_1 = -3. The number of radial nodes in this orbitals is _____.
(Round off to the Nearest Integer)

55. Ge (Z = 32) in its ground state electronic configuration has x completely filled orbitals with m_1 = 0. The value of x is _____.

56. Number of amphoteric compounds among the following is _____.
(A) BeO   (B) BaO
(C) Be(OH)₂   (D) Sr(OH)₂

57. 2 L of 0.2 M H_2SO_4 is reacted with 2 L of 0.1 M NaOH solution, the molarity of the resulting product Na_2SO_4 in the solution is _____ millimolar. (Nearest integer)

58. The mole fraction of glucose ($C_6H_{12}O_6$) in an aqueous binary solution is 0.1. The mass percentage of water in it, to the nearest integer, is _____.

59. Ferrous sulphate heptahydrate is used to fortify foods wit iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _____.
Atomic weight : Fe = 55.85; S = 32.00; O = 16.00

60. A protein 'A' contains 0.30% of glycine (molecular weight 75). The minimum molar mass of the protein A is _____ $\times 10^3 \, g\,mol^{-1}$. (Nearest integer)

MATHEMATICS

Section - A

Single Choice Question

61. If $A = \{\phi, \{\phi\}\}$, then the power set of A is
(a) A (b) $\{\phi, \{\phi\}, A\}$
(c) $\{\phi, \{\phi\}, (\{\phi\}), A\}$ (d) None of these

62. Which set is the subset of all given sets
(a) $\{1, 2, 3, 4, ...\}$ (b) $\{1\}$
(c) $\{0\}$ (d) $\{\}$

63. Let $S = \{0, 1, 5, 4, 7\}$. Then the total number of subsets of S is
(a) 64   (b) 32   (c) 40   (d) 20

64. Let $A = \{1, 2, 3, 4\}, B = \{2, 3, 4, 5, 6\}$, then $A \cap B$ is equal to
(a) {2, 3, 4}   (b){1, 2, 3}
(c) {5, 6}   (d) {1}

65. The smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is
(a) {2, 3, 5}   (b) {3, 5, 9}
(c) {1, 2, 5, 9}   (d) None of these

66. If $A \cap B = B$, then
    (a) $A \subset B$ (b) $B \subset A$ (c) $A = \phi$ (d) $B = \phi$

67. For two sets $A \cup B = A$ if
    (a) $B \subseteq A$ (b) $A \subseteq B$ (c) $A \neq B$ (d) $A = B$

68. If A = {2, 3, 4, 8, 10}, B = {3, 4, 5, 10, 12}, C = {4, 5, 6, 12, 14} then $(A \cup B) \cap (A \cup C)$ is equal to
    (a) {2, 3, 4, 5, 8, 10, 12}
    (b) {2, 4, 8, 10, 12}
    (c) {3, 8, 10, 12}
    (d) {2, 8, 10}

69. If $A \subseteq B$, then $A \cap B$ is equal to
    (a) A (b) B (c) A^c (d) B^c

70. If $N_a = [an : n \in N\}$, then $N_6 \cap N_8 =$
    (a) N_6 (b) N_8 (c) N_{24} (d) N_{44}

71. If $n(A) = 3$, $n(B) = 6$ and $A \subseteq B$. Then the number of elements in $A \cup B$ is equal to
    (a) 3   (b) 9
    (c) 6   (d) None of these

72. If A and B are not disjoint sets, then $n(A \cup B)$ is equal to
    (a) $n(A) + n(B)$
    (b) $n(A) + n(B) - n(A \cap B)$
    (c) $n(A) + n(B) + n(A \cap B)$
    (d) $n(A)n(B)$

73. Out of 800 boys in a school, 224 played cricket, 240 played hockey and 336 played basketball. Of the total, 64 played both basketball and hockey; 80 played cricket and basketball and 40 played cricket and hockey; 24 played all the three games. The number of boys who did not play any game is
    (a) 128   (b) 216   (c) 240   (d) 160

74. In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in Physics. Then the number of students who have passed in Physics only is
    (a) 22   (b) 33   (c) 10   (d) 45

75. A = {1, 2, 3} and B = {3, 8}, then $(A \cup B) \times (A \cap B)$ is
    (a) {(3, 1), (3, 2), (3, 3), (3, 8)}
    (b) {(1, 3), (2, 3), (3, 3), (8, 3)}
    (c) {(1, 2), (2, 2), (3, 3), (8, 8)}

    (d) {(8, 3), (8, 2), (8, 1), (8, 8)}

76. If R is a relation from a finite set A having m elements to a finite set B having n elements, then the number of relations from A to B is
    (a) 2^{mn} (b) $2^{mn} - 1$ (c) $2mn$ (d) m^n

77. The relation R defined on the set A = {1, 2, 3, 4, 5} by R = {$(x, y) : |x^2 - y^2| < 16$} is given by
    (a) {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)}
    (b) {(2, 2), (3, 2), (4, 2), (2, 4)}
    (c) {(3, 3), (3, 4), (5, 4), (4, 3), (3, 1)}
    (d) None of these

78. Let A = {1, 2, 3, 4} and let R = {(2, 2), (3, 3), (4, 4), (1, 2)} be a relation on A. Then R is
    (a) Reflexive   (b) Symmetric
    (c) Transitive   (d) None of these

79. Let R_1 be a relation defined by $R_1 = \{(a,b) | a \geq b, a, b \in R\}$. Then R_1 is
    (a) An equivalence relation on R
    (b) Reflexive, transitive but not symmetric
    (c) Symmetric, Transitive but not reflexive
    (d) Neither transitive not reflexive but symmetric

80. Let R be a relation on the set N be defined by {$(x, y) | x, y \in N, 2x + y = 41$}. Then R is
    (a) Reflexive   (b) Symmetric
    (c) Transitive   (d) None of these

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Section - B

Integer Type Questions

81. If the sum of two extreme numbers of an A.P. with four terms is 8 and product of remaining two middle term is 15, then greatest number of the series will be

82. Let S_n denotes the sum of n terms of an A.P. If $S_{2n} = 3S_n$, then ratio $\dfrac{S_{3n}}{S_n} =$

83. All the terms of an A.P. are natural numbers. The sum of its first nine terms lies between 200 and 220. If the second term is 12, then the common difference is

84. The minimum value of n such that $1 + 3 + 3^2 + ... + 3^n > 1000$ is

85. Let $n(>1)$ be a positive integer, then the largest integer m such that $(n^m + 1)$ divides $(1 + n + n^2 + ... + n^{127})$, is

86. If S denotes the sum to infinity and S_n the sum of n terms of the series $1 + \dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8} + ...,$ such that $S - S_n < \dfrac{1}{1000}$, then the least value of n is

87. Five number are in A.P. whose sum is 25 and product is 2520. If one of these five numbers is $-\dfrac{1}{2}$, then the greatest number amongst them is

88. If there are n harmonic means between 1 and $\dfrac{1}{31}$ and the ratio of 7th and $(n-1)^{th}$ harmonic means is 9 : 5, then the value of n will be

89. $1 + \dfrac{3}{2} + \dfrac{5}{2^2} + \dfrac{7}{2^3} + ...\infty$ is equal to

90. 150 workers were engaged to finish a piece of work in a certain number of days. 4 workers dropped the second day, 4 more workers dropped the third day and so on. It takes eight more days to finish the work now. The number of days in which the work was completed is

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