17P/203/13/II

(To be filled up by the candidate by *blue/black ball-point pen*)

Roll No. | | | | | | | | | | |

Roll No.
(Write the digits in words) .... *२द7* ....

Serial No. of OMR Answer Sheet ....

Day and Date ....

....
(Signature of Invigilator)

SEAL

INSTRUCTIONS TO CANDIDATES

(Use only *blue/black ball-point pen* in the space above and on both sides of the OMR Answer Sheet)

1. Within 30 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring **any loose** paper, written or blank, inside the Examination Hall **except the** *Admit Card without its envelope.*

3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*

4. Write your *Roll Number and Serial Number of the Answer Sheet* **by** pen in the space provided above.

5. On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.

6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and also Roll No. and OMR sheet No. on the Question Booklet.

7. Any changes in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.

8. Each question in this **Booklet** is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the Answer Sheet.

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero mark).

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit *only the OMR Answer Sheet at the* end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गये हैं।]

Total No. of Printed Pages : 30

No. of Questions : 120

Time : 2 Hours]   *[Full Marks : 360*

Note :   *(i)*   Attempt as many questions as you can. Each question carries **3 (Three)** marks. **One mark will be deducted for each incorrect answer.** Zero mark will be awarded for each unattempted question.

      (ii)   If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

1.   If $f(x) = \sqrt{1+x^2}$, then

    (1) $f(xy) = f(x)f(y)$ (2) $f(x+y) = f(x) + f(y)$

    (3) $f(xy) \geq f(x)f(y)$ (4) $f(xy) \leq f(x)f(y)$

2.   The number of selection of one or more things out of n different things is :

    (1) $2^{n-1} + 1$ (2) $2^{n-1} - 1$

    (3) $2^n + 1$ (4) $2^n - 1$

3.   Value of $^1P_1 + 2 \cdot {}^2P_2 + 3 \cdot {}^3P_3 + \ldots + n \cdot {}^nP_n$ is $\left(\text{where } {}^nP_r = \dfrac{(n)!}{(n-r)!}\right)$

    (1) $^{n+1}P_{n+1} - 1$ (2) $^{n+1}P_{n+1} + 1$

    (3) $^{n+2}P_{n+1} - 1$ (4) $^{n+2}P_{n+1} + 1$

(1)

P.T.O.

4. If $\Delta = \begin{vmatrix} a & a & x \\ m & m & m \\ b & x & b \end{vmatrix}$, then the roots of $\Delta = 0$ are :

(1) a, m

(2) a, b

(3) $-a, -b$

(4) $0, m$

5. Value of product $\left(1 - x + x^2 - x^3 + ...\infty\right)\left(1 + x + x^2 + x^3 + ...\infty\right)$ is :

(1) $1 + x^2 + x^4 + ...\infty$

(2) $1 - x^2 + x^4 - ....\infty$

(3) $1 - x^2 - x^4 - ....\infty$

(4) $1 - x^4 + x^8 - ....\infty$

6. If A is a determinant of order 3, then the value of $|A| + |-A|$ is equal to :

(1) 0

(2) 1

(3) 2

(4) $2|A|$

7. If A, B, C are non singular square matrices of order 3×3 then which of the following is not necessarily true ?

(1) $A^T A = I \Rightarrow AA^T = I$

(2) $A^{-1}B^{-1} = (BA)^{-1}$

(3) $I^{-1} = I$

(4) $(A - B)C = AC - BC$

8. If a man has 6 friends, then number of ways he may invite one or more of them to dinner is :

(1) 120

(2) 80

(3) 63

(4) 55

(2)

9. Let T_r be the rth term of an A. P. for $r = 1, 2, \ldots$. If for some positive integers m, n, we have $T_m = \dfrac{1}{n}$ and $T_n = \dfrac{1}{m}$, then T_{mn} equals :

(1) $\dfrac{1}{mn}$

(2) $\dfrac{1}{m} + \dfrac{1}{n}$

(3) 1

(4) 0

10. The number of ways 6 Americans, 5 Englishmen and 8 Indians can be seated in a row so that neither Englishmen nor Indians sit between Americans :

(1) $(14)! \times (6)!$

(2) $(15)! \times (5)!$

(3) $(11)! \times (8)!$

(4) $(19)! \times (6)!$

11. Let a, b, c be positive real numbers. The following system of equations in x, y and z

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$$

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

$$-\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

has :

(1) no solution

(2) unique solution

(3) infinitely many solutions

(4) finitely many solutions

12. If the product of n positive numbers is unity, then their sum is :

(1) a positive integer

(2) divisible by n

(3) equal to $n + \dfrac{1}{n}$

(4) never less than n

(3)

P.T.O.

13. If $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}, x \neq (2n+1)\dfrac{\pi}{2}$, then the value of $|A^T A^{-1}|$ is :

(1) $\cos 4x$ (2) 2

(3) $-\cos 4x$ (4) 1

14. In the expansion of $(x+y)^{200}$, if the coefficient $^{200}C_r$ is the greatest, then value of r is :

(1) 100   (2) 75

(3) 50   (4) 125

15. Sum of the coefficients in $(6x - 7y)^{201}$ is :

(1) 13   (2) -13

(3) 1   (4) -1

16. Coefficient of x^{-3} in the expansion of $\left(x - \dfrac{m}{x}\right)^{11}$ is :

(1) $-330\,m^7$ (2) $-340\,m^7$

(3) $-350\,m^7$ (4) $-360\,m^7$

17. If A and B are two finite sets containing respectively m and n elements, then the number of non-empty relations that can be defined from A to B is :

(1) m^n (2) $n^m - 1$ (3) $mn - 1$ (4) $2^{mn} - 1$

18. Let a 3×3 matrix A have determinant 5. If $B = 4A^2$ then the determinant of B is equal to :

(1) 20   (2) 100   (3) 320   (4) 1600

(4)

19. If $^nC_6 : {}^{n-3}C_3 = 33:4$, then value of n is :

(1) 8   (2) 11

(3) 12   (4) 14

20. Last digit of the number $(32)^{32}$ is :

(1) 2   (2) 4

(3) 6   (4) 8

21. If a, b, c, d and p are distinct real numbers such that $\left(a^2+b^2+c^2\right)p^2 - 2(ab+bc+cd)p + \left(b^2+c^2+d^2\right) \le 0$ then a, b, c, d are in :

(1) A. P.   (2) G. P.

(3) H. P.   (4) A. G. P.

22. If the sum of odd terms of $(x+a)^n$, where $n \in N$, is L and the sum of even terms is M, then the value of $L^2 - M^2$ is :

(1) $(x+a)^{2n} + (x-a)^{2n}$ (2) $\left(x^2+a^2\right)^n$

(3) $\left(a^2-x^2\right)^n$ (4) $\left(x^2-a^2\right)^n$

23. Number of ways when 10 examination papers can be arranged so that the best and worst papers never come together :

(1) $9.(10)!$ (2) $8.(9)!$ (3) $7.(8)!$ (4) $6.(7)!$

(5)

P.T.O.

24. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then which one of the following is true ?

(1) $C = A \cos\theta - B \sin\theta$

(2) $C = A \sin\theta + B \cos\theta$

(3) $C = A \sin\theta - B \cos\theta$

(4) $C = A \cos\theta + B \sin\theta$

Direction (Question No. 25 to 27) : *In the following questions, answers are to be based on the diagram given below, where the triangle represents doctors, the circle represents players and the rectangle represents artists :*
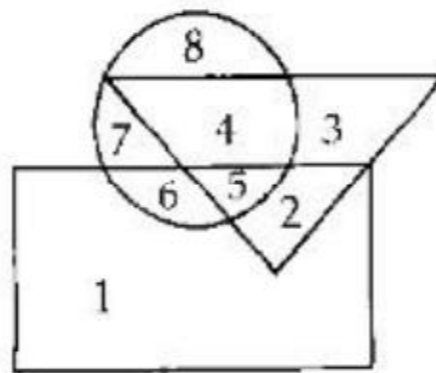
25. Which numbered space in the diagram represents doctors who are also players and artists ?

(1) 2   (2) 3   (3) 4   (4) 5

26. Which number represents artists who are also players only ?

(1) 4   (2) 6   (3) 7   (4) 8

27. Which number represents artists who are neither players nor doctors ?

(1) 1   (2) 2

(3) 3   (4) 4

28. If A is a square matrix of order $n \times n$, then adj (adj A) is equal to :

(1) $|A|^n A$

(2) $|A|^{n-1} A$

(3) $|A|^{n-2} A$

(4) $|A|^{n-3} A$

29. If $\begin{vmatrix} x & 3 & 6 \\ 3 & 6 & x \\ 6 & x & 3 \end{vmatrix} = \begin{vmatrix} 2 & x & 7 \\ x & 7 & 2 \\ 7 & 2 & x \end{vmatrix} = \begin{vmatrix} 4 & 5 & x \\ 5 & x & 4 \\ x & 4 & 5 \end{vmatrix} = 0$ then x is equal to :

(1) 9
(2) −9
(3) 0
(4) 1

30. If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$, then $\begin{vmatrix} 2a_1 + 3b_1 + 4c_1 & b_1 & c_1 \\ 2a_2 + 3b_2 + 4c_2 & b_2 & c_2 \\ 2a_3 + 3b_3 + 4c_3 & b_3 & c_3 \end{vmatrix} =$

(1) Δ

(2) $\frac{1}{2}\Delta$

(3) 2Δ

(4) $(2 \times 3 \times 4) \Delta$

31. If α and β are the roots of the equation $5x^2 - x - 2 = 0$, then the equation for which roots are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$ is :

(1) $x^2 - x + 10 = 0$

(2) $x^2 - x - 10 = 0$

(3) $x^2 + x + 10 = 0$

(4) $x^2 + x - 10 = 0$

32. If the set A contains 5 elements and the set B contains 6 elements, then the number of one-one and onto mappings from A to B is :

(1) 720
(2) 120
(3) 0
(4) 30

(7)

33. Domain of the function $f(x) = \sqrt{a^2 - x^2}$, $a > 0$, is :

    (1) $(-a, a)$ (2) $[-a, a]$ (3) $[0, a]$ (4) $\{-a, 0\}$

34. The distance between the parallel lines $9x^2 - 6xy + y^2 + 18x - 6y + 8 = 0$ is :

    (1) $\dfrac{1}{\sqrt{10}}$ (2) $\dfrac{2}{\sqrt{10}}$ (3) $\dfrac{4}{\sqrt{10}}$ (4) $\sqrt{10}$

35. At what point on the parabola $y^2 = 4x$ and the normal makes equal angle with the axes ?

    (1) $(4, 4)$ (2) $(9, 6)$ (3) $(4, -4)$ (4) $(1, -2)$

Direction (Question No. 36 to 40) : In each of the following questions, two statements are given followed by three or four conclusions numbered I, II, III and IV. You have to take the given statements to be true even if they seem to be at variance from the commonly known facts and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

36. Statements : All branches are flowers. All flowers are leaves.

    Conclusions :

    I. All branches are leaves.   II. All leaves are branches.

    III. All flowers are branches.   IV. Some leaves are branches.

    (1) None follows   (2) Only I and IV follow

    (3) Only II and III follow   (4) All follows

(8)

37. *Statements* : All politicians are honest. All honest are fair.

   Conclusions :

   I. Some honest are politicians.   II. No honest is politician.

   III. Some fair are politicians.   IV. All fair are politicians.

   (1) None follows   (2) Only I follow

   (3) Only I and II follow   (4) Only I and III follow

38. *Statements* : All terrorists are guilty. All terrorists are criminals.

   Conclusions :

   I. Either all criminals are guilty or all guilty are criminals.

   II. Some guilty persons are criminals.

   III. Generally criminals are guilty.

   IV. Crime and guilt go together.

   (1) Only I follow   (2) Only I and III follow

   (3) Only II follow   (4) Only II and IV follow

39. *Statements* : All dolls are windows. All bottles are windows. All cars are bottles.

   Conclusions :

   I. All cars are windows.   II. Some cars are dolls.

   III. Some windows are cars.

   (1) Only I and II follow   (2) Only II and III follow

   (3) Only I and III follow   (4) All follows

(9)

40. *Statements* : All fruits are vegetables. All pens are vegetables. All vegetables are rains.

   Conclusions :

   I.   All fruits are rains.   II. All pens are rains.
   III. Some rains are vegetables.

   (1) None follows   (2) Only I and II follow
   (3) Only I and III follow   (4) All follows

41. If $f(x) = ax + b$ and $g(x) = cx + d$, then $f(g(x)) = g(f(x))$ for all $x \in R$ if and only if :

   (1) $f(a) = g(c)$ (2) $f(b) = g(b)$
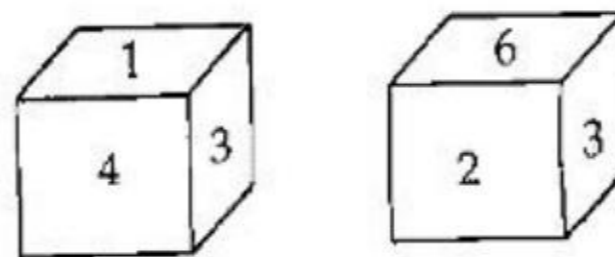   (3) $f(d) = g(b)$ (4) $f(c) = g(a)$

42. Let $a = 33^n$, $n \in N$, if exponent choosen at random the probability that the unit digit of a will be 9 is :

   (1) 1/2   (2) 1/3
   (3) 1/4   (4) 1/9

43. Which of the following is the same as Lung, Pharynx, Bronchioles ?

   (1) Alveoli   (2) Ribs
   (3) Oesophagus   (4) Nephrons

44. Two positions of a block are shown below :

   when 5 is at the top, which number will be at the bottom ?

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

(10)

45. If 3rd December, 2000 was Sunday, what day was 3rd January, 2001 ?

    (1) Tuesday   (2) Wednesday

    (3) Thursday   (4) Friday

46. Let R be the relation defined on the set N of natural numbers by the rule xRy iff $x + 2y = 8$, the domain of R is :

    (1) {2, 4, 8}   (2) {2, 4, 6}

    (3) {2, 4, 6, 8}   (4) {1, 2, 3, 4}

47. If $[x]$ denotes the integral part of x, then the solution set of the equation $[x]^2 - 5[x] + 6 = 0$ is $(x \in R)$

    (1) [3, 4]   (2) (2, 3]

    (3) [2, 3]   (4) [2, 4)

48. The domain and range of the real function f defined by $f(x) = \dfrac{4-x}{x-4}$ are given by :

    (1) $D_f = R, R_f[-1, 1]$ (2) $D_f = R - \{4\}, R_f = \{-1\}$

    (3) $D_f = R - \{1\}, R_f = R$ (4) $D_f = R - \{-4\}, R_f = \{-1, 1\}$

49. Let $f : R \to R$ be defined by $f(x) = \dfrac{1}{x}$ for all $x \in R$, then f is :

    (1) one-one   (2) onto

    (3) bijective   (4) not defined

(11)

P.T.O.

50. If the straight line $ax + by + c = 0$ and $x \cos \alpha + y \sin \alpha = c$ enclose an angle $\frac{\pi}{4}$ between them and meet the straight line $x \cos \alpha - y \sin \alpha = 0$ in the same point then :

(1) $a^2 + b^2 = c^2$

(2) $a^2 + b^2 = 2$

(3) $a^2 + b^2 = 2c^2$

(4) $a^2 + b^2 = 4$

51. Let $f : [0, 1] \to [0, 1]$ be defined by $f(x) = \begin{cases} x & , \quad \text{if } x \text{ is rational} \\ 1-x & , \quad \text{if } x \text{ is irrational} \end{cases}$ then fof is :

(1) constant

(2) $1 + x$

(3) x

(4) $1 - x$

52. Let us define a relation R_1 on R as aR_1b if $a \geq b$. Then R_1 is :

(1) an equivalence relation

(2) Reflexive, transitive but not symmetric

(3) Symmetric, transitive but not reflexive

(4) Neither transitive nor reflexive but symmetric

53. If $\dfrac{x^2 - bx}{ax - c} = \dfrac{m-1}{m+1}$ has roots which are numerically equal but of opposite signs, the value of m must be :

(1) $\dfrac{a-b}{a+b}$

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

(3) c

(4) 1

54. The line $y = mx + 1$ is a tangent of parabola $y^2 = 4x$ if :

(1) $m = 1$

(2) $m = 2$

(3) $m = 4$

(4) $m = 3$

(12)

55. The Locus of a point which moves so that the difference of its distances from two fixed straight line which are at right angle is equal to the distance from another fixed straight line is :

   (1) a straight line   (2) a circle

   (3) a parabola   (4) an ellipse

56. The number of distinct tangent that can be drawn from the origin to the circle $x^2 + y^2 = 2(x + y)$ is :

   (1) 0   (2) 1   (3) 2   (4) 3

57. The roots of $Ax^2 + Bx + C = 0$ are r and s. For the roots of $x^2 + px + q = 0$ to be r^2 and s^2, p must be equal to :

   (1) $\dfrac{B^2 - 4AC}{A^2}$ (2) $\dfrac{B^2 - 2AC}{A^2}$

   (3) $\dfrac{2AC - B^2}{A^2}$ (4) $B^2 - 2C$

58. The identity element for the binary operation $*$ defined on $Q - \{0\}$ as $a * b = \dfrac{ab}{2}$ for all $a, b \in Q - \{0\}$ is :

   (1) 1   (2) 0

   (3) 2   (4) $\dfrac{1}{2}$

(13)

P.T.O.

59. The number of the value of c such that the straight line $y = 4x + c$ touch the curve $\dfrac{x^2}{4} + y^2 = 1$ is :

   (1) 0   (2) 1

   (3) 2   (4) Infinite

60. Which of the following functions from Z into Z are bijections ?

   (1) $f(x) = x^3$ (2) $f(x) = x + 2$

   (3) $f(x) = 2x + 1$ (4) $f(x) = x^2 + 1$

61. The value of m for which $y = mx + 6$ is a tangent to the hyperbola $\dfrac{x^2}{100} - \dfrac{y^2}{49} = 1$ is :

   (1) $\sqrt{\dfrac{17}{20}}$ (2) $\sqrt{\dfrac{20}{17}}$

   (3) $\sqrt{\dfrac{3}{20}}$ (4) $\sqrt{\dfrac{20}{3}}$

62. $\displaystyle \lim_{x \to 0} \dfrac{\sin\left(\pi \cos^2 x\right)}{x^2}$ equal to :

   (1) $-\pi$ (2) π

   (3) $\dfrac{\pi}{2}$ (4) 1

(14)

63. Dialing a telephone number an old man forgets the last two digits remembering only that these are different dialled at random. The probability that the number is dialled correctly is :

(1) $\dfrac{1}{45}$

(2) $\dfrac{1}{90}$

(3) $\dfrac{1}{100}$

(4) $\dfrac{1}{50}$

64. If $I = \int\limits_{0}^{1} x(1-x)^{\frac{2007}{2}}\, dx$ then I equal to :

(1) $\dfrac{2007}{2}$

(2) $\dfrac{2011}{2}$

(3) $\dfrac{2009}{2}$

(4) None of these

65. If Z_1, Z_2 are complex number such that $\dfrac{2Z_1}{3Z_1}$ is purely imaginary number then value of $\left|\dfrac{Z_1-Z_2}{Z_1+Z_2}\right|$ is :

(1) 0

(2) 1

(3) 2

(4) 3

66. The length of longest interval in which the function $3\sin x - 4\sin^3 x$ is increasing, is :

(1) $\pi/3$

(2) $\pi/2$

(3) $3\pi/2$

(4) π

(15)

P.T.O.

67. $\dfrac{1+2i+3i^2}{1-2i+3i^2}$ equals :

(1) i

(2) -1

(3) $-i$

(4) 4

68. The eccentric angle of a point on the ellipse $\dfrac{x^2}{6}+\dfrac{y^2}{2}=1$ whose distance from the centre of the ellipse is 2 is :

(1) $\dfrac{\pi}{4}$

(2) $\dfrac{3\pi}{2}$

(3) $\dfrac{5\pi}{3}$

(4) $\dfrac{7\pi}{6}$

69. If $u-f(x^3)$, $v-g(x^2)$, $f'(x)=\cos x$ and $g'(x)=\sin x$ then $\dfrac{du}{dv}$ is :

(1) $\dfrac{3}{2}x \cdot \cos x^3 \cdot \operatorname{cosec} x^2$

(2) $\dfrac{2}{3}\sin x^3 \cdot \sec x^2$

(3) $\tan x$

(4) $\dfrac{1}{3}\sin^3 x \cdot \operatorname{cosec}^2 x$

70. $\displaystyle\lim_{x\to 0}\dfrac{\sin x-x+\dfrac{1}{6}x^3}{x^5}=$

(1) $\dfrac{1}{60}$

(2) $\dfrac{1}{120}$

(3) $\dfrac{1}{30}$

(4) $\dfrac{1}{180}$

71. The sum to n terms of the series $\dfrac{3}{1^2}+\dfrac{5}{1^2+2^2}+\dfrac{7}{1^2+2^2+3^2}+\ldots$ is :

(1) $\dfrac{6n}{n+1}$

(2) $\dfrac{9n}{n+1}$

(3) $\dfrac{12n}{n+1}$

(4) $\dfrac{3n}{n+1}$

(16)

72. Find the missing number :

    2   6   4

5 (9) 12   10 (8) 8   3 (?) 7

    6   4   1

(1) 5

(2) 6

(3) 7

(4) 8

73. If × means −, − means +, + means ÷, ÷ means ×, then value of $16 × 4 + 10 ÷ 5 − 10$ is :

(1) 28   (2) 38   (3) 18   (4) 24

Direction (Question No. 74 to 76) : In the following questions there are given some statements followed by conclusions that can be drawn from them. Choose the conclusion which appeals to you to be the most correct :

74. The presence of calcium in milk makes it white. Rice, too, is white. Therefore, rice also contains calcium.

(1) False

(2) Probably true

(3) True

(4) Can't say

75. Hydrogen is lighter than oxygen. Hydrogen is lighter than helium. Therefore, oxygen is the heaviest of the three gases.

(1) False

(2) Probably false
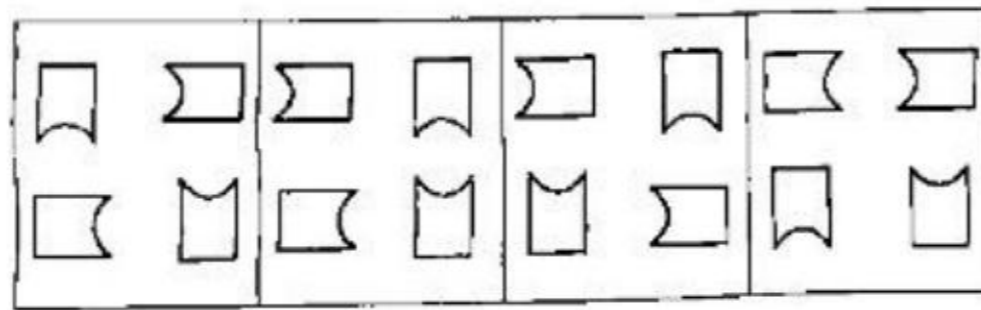
(3) True

(4) Can't say

(17)

P.T.O.

76. People who are bald are generally of the intellectual type. Arun is bald. Therefore Arun is an intellectual.

    (1) False　　　　　　　　　　(2) Probably true

    (3) True　　　　　　　　　　　(4) Can't say

77. If p parallel lines are intersected by q other parallel lines, then number of parallelograms so formed :

    (1) $\frac{1}{4}pq(p+1)(q-1)$　　　　　　(2) $\frac{1}{4}pq(p-1)(q+1)$

    (3) $\frac{1}{4}pq(p-1)(q-1)$　　　　　　(4) $\frac{1}{4}pq(p+1)(q+1)$

78. Find 'odd-one-out' in the following figure :

    (1)　　　　　(2)　　　　　(3)　　　　　(4)

79. In a row Ram is at the 17th place from left and Hari at the 11th place from right. If there are 5 persons between them, then the place of Hari from left will be :

    (1) 22nd　　　(2) 23rd　　　(3) 24th　　　(4) 20th

80. A hemispherical bowl of internal radius 9 cm contains a liquid. This liquid is to be filled into cylindrical shaped small bottles of diameter 3 cm and height 4 cm. How many bottles will be needed to empty the bowl ?

    (1) 27　　　　(2) 35　　　　(3) 54　　　　(4) 63

81. The derivative of $\tan^{-1}\left\{\dfrac{\sqrt{1+x^2}-1}{x}\right\}$ with respect to $\tan^{-1}\left\{\dfrac{2x\sqrt{1-x^2}}{1-2x^2}\right\}$ at $x=0$:

   (1) $\dfrac{1}{4}$ (2) $\dfrac{1}{8}$ (3) $\dfrac{1}{2}$ (4) 1

82. $\int 5^{5^{5^x}} \cdot 5^{5^x} \cdot 5^x \, dx$ is equal to :

   (1) $\dfrac{5^{5^x}}{(\log 5)^3}+c$ (2) $5^{5^{5^x}}(\log 5)^3+c$

   (3) $\dfrac{5^{5^{5^x}}}{(\log 5)^3}+c$ (4) $5^{5^x}(\log 5)^3+c$

83. If $Z=\dfrac{1}{1-\cos\theta+i\sin\theta}$ then $\text{Re}(Z)=$

   (1) 0

   (2) $\dfrac{1}{2}$

   (3) $\cot\theta/2$

   (4) $\dfrac{1}{2}\cot\dfrac{\theta}{2}$

84. If e and e' be the eccentricities of a hyperbola and its conjugate then $\dfrac{1}{e^2}+\dfrac{1}{e'^2}=?$

   (1) 0   (2) 1

   (3) 2   (4) None of these

85. The tangent of the curve $y=e^{2x}$ at the point $(0,1)$ meets x-axis at :

   (1) $(0,2)$ (2) $(2,0)$

   (3) $\left(-\dfrac{1}{2},0\right)$ (4) $(-2,0)$

(19)

86. Two cards are randomly selected one by one from a deck of 52 playing cards. The probability that both cards are greater than 3 and less than 8 is :

(1) $\dfrac{16}{169}$

(2) $\dfrac{81}{169}$

(3) $\dfrac{20}{221}$

(4) $\dfrac{45}{221}$

87. The slope of the tangent to the curve $y = \int\limits_{0}^{x} \dfrac{dx}{1+x^3}$ at the point where $x = 1$ is :

(1) $\dfrac{1}{2}$

(2) 1

(3) $\dfrac{1}{4}$

(4) $\dfrac{1}{5}$

88. The polar form of $(i^{25})^3$ is :

(1) $\cos \pi/2 + i \sin \pi/2$

(2) $\cos \pi + i \sin \pi$

(3) $\cos \pi - i \sin \pi$

(4) $\cos \pi/2 - i \sin \pi/2$

89. One hundred cards are numbered from 1 to 100. The probability that a randomly chosen card has a digit 5 is :

(1) $\dfrac{1}{100}$

(2) $\dfrac{9}{100}$

(3) $\dfrac{19}{100}$

(4) $\dfrac{11}{100}$

(20)

90. If $Z = \dfrac{1+7i}{(2-i)^2}$ then :

(1) $|Z| = 2$

(2) $|Z| = 1/2$

(3) amp $(Z) = \pi/4$

(4) amp $(Z) = \dfrac{3\pi}{4}$

Direction : (Question No. 91 to 93) : Refer to the data below and answer the questions.

In a town of 1000 people, a survey found that 25% of the population played football or hockey or cricket or more than one of these games regularly. 85 played hockey, 160 played football, 200 played cricket, and 45 played all the three games. While 20 played only football and 70 played only cricket, 20 played both hockey and football, but not cricket.

91. How many people played only football and cricket ?

(1) 110

(2) 75

(3) 70

(4) 120

92. What percentage of the total population plays at least 2 games ?

(1) 150

(2) 20

(3) 15

(4) 24

93. If 30% of the people who play only hockey and cricket are females, how many women play hockey and cricket ?

(1) 3

(2) 8

(3) 2

(4) Indeterminate

94. If $x = \log_a(bc), y = \log_b(ca)$ and $z = \log_c(ab)$ then which of the following is equal to 1 ?

(1) $x + y + z$

(2) $(1+x)^{-1} + (1+y)^{-1} + (1+z)^{-1}$

(3) xyz

(4) None of these

(21)

P.T.O.

95. The solution set of $\log_2 |4 - 5x| > 2$ is :

(1) $\left(\dfrac{8}{5}, +\infty\right)$

(2) $\left(\dfrac{4}{5}, \dfrac{8}{5}\right)$

(3) $(-\infty, 0) \cup \left(\dfrac{8}{5}, +\infty\right)$

(4) None of these

Direction (Question No. 96 & 97) : In each of the following questions, a group of three inter-related words is given. Choose a word from the given alternatives, that is similar to the given words and hence belongs to the same group :

96. Jam : Jelly : Pickles

(1) Butter

(2) Marmalade

(3) Grapes

(4) Preservative

97. Botany : Zoology : Cardiology

(1) Morphology

(2) Seismology

(3) Pedology

(4) Taxonomy

98. Arrange the following words according to dictionary arrangement :

1. Epitaxy   2. Episode   3. Epigene   4. Epitome

5. Epilogue

(1) 1, 2, 3, 4, 5

(2) 3, 2, 5, 4, 1

(3) 3, 5, 2, 1, 4

(4) 5, 4, 2, 1, 3

(22)

Direction (Question No. 99 to 101) : Dryland farming is the only way to not only combat recurring drought but also meet the increasing food requirements of India. About 45% of India's total crop production now comes from drylands. By the end of this century, this will have to increase to 60% if India is to provide adequate food for projected population of one billion by the turn of the century :

99. Dryland farming is important for India.

    (1) Data inadequate   (2) Definitely true

    (3) Propabably true   (4) Probably false

100. India is self-sufficient in food production.

    (1) Definitely true   (2) Probably true

    (3) Data inadequate   (4) Probably false

101. In India, the rate of growth of population is 15 percent per year.

    (1) Data inadequate

    (2) Probably true

    (3) Definitely true

    (4) Probably false

102. If $y^2 = P(x)$ is polynomial of order 3 then $2\dfrac{d}{dx}\left\{y^3\dfrac{d^2y}{dx^2}\right\}$ equal to :

    (1) $P''(x) + P'(x)$ (2) $P''(x).P'''(x)$

    (3) $P(x).P''(x)$ (4) A constant

(23)

P.T.O.

103. A is father of X; B is mother of Y. The sister of X and Z is Y. Which of the following statements is definitely not true ?

(1) B is the mother of Z

(2) X is the sister of Z

(3) Y is the son of A

(4) B has one daughter

104. Find the wrong number in the series :

3, 8, 15, 24, 34, 48, 63

(1) 15   (2) 24   (3) 34   (4) 48

105. *Exercise* is to *Obesity* as *Water* is to ....?........

(1) Thirst

(2) Alcohol

(3) Drink

(4) Purity

106. Five girls are sitting in a row. Rashi is not adjacent to Sulekha or Abha. Anuradha is not adjacent to Sulekha. Rashi is adjacent to Monika. Monika is at the middle in the row. Then Anuradha is adjacent to whom out of the following ?

(1) Rashi

(2) Sulekha

(3) Abha

(4) Monika

(24)

107. If CONTRIBUTE is written as ETBUIRNTOC, then which letter will be in the sixth place when counted from the left if POPULARISE is written in the same way ?

   (1) R   (2) I

   (3) A   (4) L

108. If $\log_{ax} x, \log_{bx} x, \log_{cx} x$ are in HP, where a, b, c, x belong to $(1, +\infty)$, then a, b, c are in :

   (1) AP   (2) GP

   (3) HP   (4) None of these

109. If $\log_{0.04}(x-1) \geq \log_{0.2}(x-1)$ then x belongs to the interval :

   (1) $(1, 2]$ (2) $(-\infty, 2]$

   (3) $[2, +\infty)$ (4) None of these

110. In a certain code, PLEADING is written as FMHCQMFB. How is SHOULDER written in that code ?

   (1) KCDQTIPV   (2) QDCKVPIT

   (3) QDCKTIPV   (4) TIPVQDCK

(25)

P.T.O.

111. Find the missing number :

$$1 \quad 7\,(169)\,2 \quad 3$$

$$1 \quad 5\,(121)\,2 \quad 3$$

$$1 \quad 6\,(\,?\,)\,4 \quad 5$$

(1) 196

(2) 246

(3) 250

(4) 256

112. If $\log_{0.5}\sin x = 1 - \log_{0.5}\cos x$ then the number of solution of $x \in [-2\pi, 2\pi]$ is :

(1) 3

(2) 2

(3) 1

(4) 4

113. Two natural numbers a and b are selected at random the probability that $(a^2 + b^2)$ is divisible by 7 is :

(1) 3/8

(2) 1/7

(3) 3/49

(4) 1/49

114. The constant term in the expansion of $\dfrac{x + \log_e(1-x)}{x^3}$ is :

(1) $-\dfrac{1}{3}$

(2) 0

(3) $-\dfrac{1}{2}$

(4) $\dfrac{1}{3}$

(26)

115. The area enclosed between the curve $y = ax^2$ and $x = ay^2 (a > 0)$ is 1 square unit the value of a :

(1) 1/3

(2) 2/3

(3) 1/4

(4) 1/5

116. *Shirt* is related to *Button* in the same way as *Shoes* is related to ....?........

(1) Stitch

(2) Leg

(3) Socks

(4) None of these

117. Find the next term in the series :

BMO, EOQ, HQS, ?

(1) KSU

(2) LMN

(3) SOV

(4) SOW

118. X was born on March 6, 1993. The same year Independence Day was celebrated on Friday. On which day was X born ?

(1) Wednesday

(2) Thursday

(3) Friday

(4) Saturday

119. Find 'odd-one-out' in the following figure :

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

(27)
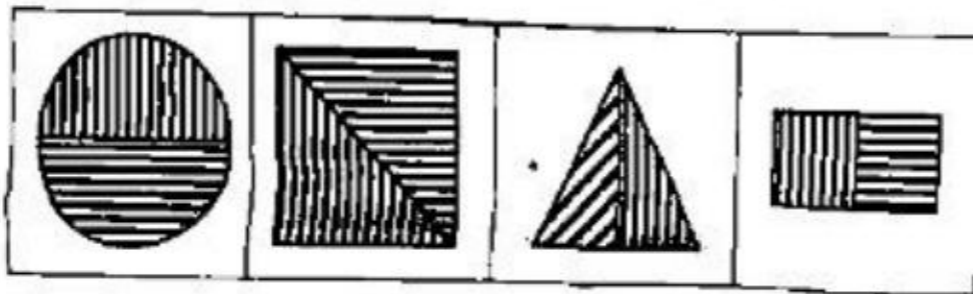
120. Examine the following relationships among members of a family of six persons A, B, C, D, E and F.

I. The number of males equals that of females.

II. A and E are sons of F.

III. D is the mother of two, one boy and one girl.

IV. B is the son of A.

V. There is one married couple in the family at present.

Which one of the following inferences can be drawn from the above ?

(1) A, B and C are all females

(2) A is the husband of D

(3) D is the grand daughter of F

(4) E and F are children of D

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा ओ०एम०आर० उत्तर-पत्र के दोनों पृष्ठों पर केवल *नीली/काली बाल-प्वाइंट पेन से ही लिखें*)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद है और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त* लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।

4. अपना *अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से* निर्धारित स्थान पर लिखें।

5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक संख्या और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। *प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार बाल-प्वाइंट पेन से गाढ़ा करना है।*

9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ कार्य के लिये इस पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा अंतिम खाली पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त *केवल ओ० एम० आर० उत्तर-पत्र ही* परीक्षा भवन में जमा करें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की भागी होगा/होगी।