APTITUDE : 15 QUESTIONS (2 MARKS EACH)

MATHEMATICS : 30 QUESTIONS (2 MARKS EACH)

MATHEMATICS : 20 QUESTIONS (3 MARKS EACH

DURATION : 90 MINUTES

APTITUDE (15 QUESTIONS)
Question No. 1 to 15 carry 2 marks each

1. If Rajan can read 125 pages of a 350 pages book in 5 hrs, how much more time will he take to finish the book?
   (A) 7 hrs (B) 14 hrs
   (C) 9 hrs (D) 10 hrs

2. In the first 10 Overs of a cricket match, the run rate was only 3.2. What should be the run rate in the remaining 40 Overs to reach the target of 282 runs?
   (A) 5.20 (B) 5.00
   (C) 7.05 (D) 6.25

3. From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?
   (A) 453 (B) 556
   (C) 655 (D) 756

4. Ocean : Desert : : Waves :
   (A) Dust (B) Water
   (C) Sand Dunes (D) Ripples

5. Author : Manuscript : :
   (A) Doctor : Stethoscope (B) Engineer : Bridge
   (C) Architect : Blueprint (D) Optician : Spectacles

6 . Rectangle : Pentagon : :
   (A) Triangle : Rectangle (B) Diagonal : Perimeter
   (C) Side : Angle (D) Circle : Square

7. Look at this series: 2, 6, 18, 54, ... What number should come next?
   (A) 108 (B) 148
   (C) 162 (D) 216

8. Statement : A large number of people in ward X of the city are diagnosed to be suffering from a fatal malaria type.
   Courses of Action: I. The city municipal authority should take immediate steps to carry out extensive fumigation in ward X.
   II. The people in the area should be advised to take steps to avoid mosquito bites.
   (A) Only I follows (B) Only II follows
   (C) Neither I nor II follows (D) Both I and II follow

9. A family pays $800 per year for an insurance plan that pays 80 percent of the first $1,000 in expenses and 100 percent of all medical expenses thereafter. In any given year, the total amount paid by the family will equal the amount paid by the plan when the family's medical expenses total which of the following?
   (A) $1,000 (B) $1,200
   (C) $1,400 (D) $1,800

10. What will be the ratio between ages of Sam and Albert after 5 years?
    I. Sam's present age is more than Albert's present age by 4 years.
    II. Albert's present age is 20 years.
    III. The ratio of Albert's present age to Sam's present age is 5 : 6.
    (A) Any two of I, II and III (B) II only
    (C) III only (D) I or III only

Direction (Questions 11 - 12) : The questions below are followed by two arguments marked as I and II. You have to decide which of the arguments a 'STRONG' argument is and which a 'WEAK' argument is. Give answer (A) : If only argument I is strong (B) : If only argument II is strong
(C) : If either I or II is strong (D) : If neither I nor II is strong

11. Should 'Luxury Hotels' be banned in India?
    I. Yes. They are places from where international criminals operate.
    II. No. Affluent foreign tourists will then have no places to stay.

12. Should there be a directive advocating that strikes be banned?
    I. Yes. Because strikes lead to loss of production which we can't afford if our economy is to be bettered.
    II. No. Because the employees will loss their right to call strike for their just demands.

13. If a real estate agent received a commission of 6 percent of the selling price of a certain house, what was the selling price of the house ?
    I. The selling price minus the real estate agent's commission was Rs. 84600.
    II. The selling price was 250 percent of the original purchase price of Rs. 36000.

    (A) Statement I alone is sufficient, but statement II alone is not sufficient.
    (B) Statement II alone is sufficient, but statement I alone is not sufficient.
    (C) Each statement alone is sufficient.
    (D) Statements I and II together are not sufficient.

14. What will be the total weight of 10 poles, each of the same weight ?
    I. One-fourth of the weight of each pole is 5 kg.
    II. The total weight of three poles is 20 kilograms more than the total weight of two poles.

    (A) Statement I alone is sufficient, but Statement II alone is not sufficient to answer the question
    (B) Statement II alone is sufficient, but Statement I alone is not sufficient to answer the question
    (C) Both statements taken together are sufficient to answer the question, but neither statement alone is sufficient
    (D) Each statement alone is sufficient

15. Who among P, Q, T, V and M is exactly in the middle when they are arranged in ascending order of their heights ?
    I. V is taller than Q but shorter than M.
    II. T is taller than Q and M but shorter than P.

    (A) Statement I alone is sufficient, but Statement II alone is not sufficient to answer the question
    (B) Statement II alone is sufficient, but Statement I alone is not sufficient to answer the question
    (C) Both statements taken together are sufficient to answer the question, but neither statement alone is sufficient
    (D) Statements I and II together are not sufficient, and additional data is needed to answer the question

MATHEMATICS (30 QUESTIONS)
DIRECTION : QUESTION NO. 16 TO 45 CARRY 2 MARKS EACH

16. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three non-planar vectors such that $[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}] = k[\vec{a} \quad \vec{b} \quad \vec{c}]$, then k is equal to
(A) 0 (B) 1
(C) 2 (D) 3

17. Let $S = \{1, 2, 3\}$. Then which of the following is an equivalence relation
(A) $\rho = \{(1, 1), (2, 2), (3, 3), (1, 3)\}$
(B) $\rho = \{(1, 2), (2, 1), (3, 1), (1, 3)\}$
(C) $\rho = \{(1, 1), (2, 2), (3, 3), (1, 3), (3, 1), (2, 3), (3, 2)\}$
(D) $\rho = \{(1, 1), (2, 2), (3, 3), (1, 3), (3, 1)\}$

18. Let $y = e^{2x}$ and $y = e^{3x}$ be two solutions of a differential equation $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Q = 0$, where P and Q are constants. Then the general solution is
(A) $y = e^{2x} + B\,e^{3x}$ (B) $y = e^{2x} + e^{3x}$
(C) $y = Ae^{2x} + B\,e^{3x}$ (D) $y = Ae^{2x} + e^{3x}$
where A and B are arbitrary constants

19. The set of points where the function $f(x) = |x-1|\,e^x$ is differentiable, is
(A) $(-\infty, \infty)$ (B) $(-\infty, \infty) - \{1\}$
(C) $[0, \infty)$ (D) $(-\infty, \infty) - \{0\}$

20. The coordinate axes are rotated through an angle $\frac{\pi}{4}$ in the positive direction. Then the coordinate of the point $(-2, 4)$ referred to new axes is
(A) $(\sqrt{2}, 3\sqrt{2})$ (B) $(\sqrt{2}, \sqrt{2})$
(C) $(2, -4)$ (D) $(\sqrt{2}, 3)$

21. If $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = k\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$, then the value of k is
(A) abc (B) 2
(C) $2abc$ (D) 1

22. The trace of a Square matrix is equal to
(A) Difference of the eigen values of that matrix
(B) Sum of the eigen values of that matrix
(C) Product of the eigen values of that matrix
(D) None of these

23. If OAB is a triangle and if OA = a and OB = b then the value of AB is
(A) b - a (B) a + b
(C) a – b (D) None of these

24. Poisson distribution has the mean
(A) μ (B) np
(C) μ^2 (D) npq

25. Equation of a circle whose centre is (h, k) radius a, centre lies on x - axis
(A) $x^2 + y^2 = a^2$ (B) $(x-h)^2 + y^2 = a^2$
(C) $x^2 + (y-k)^2 = a^2$ (D) None of these

26. The points $(1,\ 1),\ (-5,\ 5)$ and $(13,\ \beta)$ lie on the same straight line, if β is equal to
(A) 0 (B) -11
(C) 7 (D) -7

27. If the complex numbers $z_1,\ z_2$ and z_3 are in AP, then they lie on
(A) A circle (B) A parabola
(C) A straight line (D) An ellipse

28. Let $\rho(X,\ Y)$ be the correlation coefficient of two random variables X and Y. Then
(A) $0 \leq \rho(X,\ Y) \leq 1$ (B) $-1 \leq \rho(X,\ Y) \leq 0$
(C) $-1 < \rho(X,\ Y) < 1$ (D) $-1 \leq \rho(X,\ Y) \leq 1$

29. Let $f(x,\ y) = \begin{cases} x \sin\frac{1}{y} + y \sin\frac{1}{x}, & if\ xy \neq 0 \\ 0, & if\ xy = 0 \end{cases}$. Then the value of $\lim_{(x,y)\to(0,0)} f(x,\ y)$ is
(A) 0 (B) 1
(C) 2 (D) Does not exist

30. Which of the following is true ?
(A) $A \cap \emptyset = A$ (B) $A \cap \emptyset = \emptyset$
(C) $A \cap \emptyset = A'$ (D) $A \cup \emptyset = \emptyset$

31. The angle between the straight lines $x - y\sqrt{3} = 5$ and $x\sqrt{3} + y = 7$ is
(A) 90^0 (B) 60^0
(C) 75^0 (D) 30^0

32. The correlation coefficient between the variables (x,y) is positive then curve passing through (x, y)
(A) Slopes downward to the right (B) Rises upward to the right
(C) Is curvilinear (D) None of these

33. If A={1,2,3} then which one is a function defined on A
(A) f={(1,2),(2,3),(1,1)} (B) g={(1,1),(2,2)}
(C) h={(1,1),(2,2),(3,3)} (D) k={(1,1),(1,2),1,3)}

34. A matrix of order n is orthogonal if
(A) $AA^T=I_n$ (B) $A=A^{-1}$
(C) $A=A^2$ (D) None of these

35. Let $S=\lim_{n\to\infty}(1+a+a^2+\ldots a^n)$, $0<a<1$ then S equals to
(A) a (B) 1/a
(C) 1/(1-a) (D) 1/(1+a)

36. Let $\vec{a},\ \vec{b}, \vec{c}$ be three vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, $|\vec{a}| = 1$, $|\vec{b}| = 2$ and $|\vec{c}| = 3$, then $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$ is equal to
(A) 0 (B) -7
(C) 7 (D) 1

37. The number of points where $g(f(x)$ is discontinuous given that $g(x) = \frac{1}{x^2+x}$ and $f(x) = x - 3$ is

(A) 1 (B) 2
(C) 3 (D) 4

38. The differential equation of all parabola having their axes parallel to the y - axis is

(A) $\frac{d^3y}{dx^3} = 0$ (B) $\frac{d^2y}{dx^2} = \frac{dy}{dx}$

(C) $\frac{d^3x}{dy^3} = 0$ (D) $\frac{d^2y}{dx^2} = 0$

39. Let $f(x,y) = \begin{cases} \frac{xy}{x^2+y^2} & for\ (x,y) \neq (0,0) \\ 0 & for\ (x,y) = (0,0) \end{cases}$. Then $\frac{\partial f}{\partial x}$ at point $(0,0)$

(A) *1* (B) Does not exist
(C) *0* (D) *2*

40. The complex number sinx + icos2x and csx - isin2x are conjugate to each other, for

(A) x = nπ (B) x = 0
(C) x = (n + 1/2) π (D) No value of x

41. The square root of 17 + 12√2 is given by

(A) 3 - 2√5 (B) 3 + 2√2
(C) 3 - 3√5 (D) 3 + 3√5

42. $\lim_{x\to 0}\left(\frac{1}{3+21/x}\right)$

(A) 1 (B) 0
(C) does not exist (D) -1

43. The asymptotes of the curve r log θ = a are

(A) r sinθ – r = a (B) r sinθ = a log r
(C) r sin(θ - 1) = log a (D) r sin (θ - 1) = a

44. The equation of a circle in polar coordinates is given by

(A) r^2 - 2r cos(θ - α) + c^2 - a^2 = 0 (B) r^2 - 2r sin(θ - α) + c^2 - a^2 = 0
(C) r^2 - r cos(θ - α) + c^2 - a^2 = 0 (D) None of these

45. The number of different permutation of n different things taken K at a time without repetition is

(A) n! (B) nk
(C) n!/K! (D) n! / (n - k)!

MATHEMATICS (20 QUESTIONS)
DIRECTION : QUESTION NO. 46 TO 65 CARRY 3 MARKS EACH

46. If e_1 is the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{7} = 1$ and e_2 is the eccentricity of the hyperbola $\frac{x^2}{9} - \frac{y^2}{7} = 1$, then $e_1 + e_2$ is equal to

(A) $\frac{17}{20}$ (B) $\frac{25}{17}$

(C) $\frac{7}{25}$ (D) $\frac{25}{12}$

47. If m and σ^2 are the mean and the variance of a random variable X, whose distribution is given by

X	0	1	2	3
$P(X)$	$\frac{1}{3}$	$\frac{1}{2}$	0	$\frac{1}{6}$

Then

(A) $m = \sigma^2 = 2$ (B) $m = 1,\ \sigma^2 = 2$

(C) $m = \sigma^2 = 1$ (D) $m = 2,\ \sigma^2 = 1$

48. If $Z = x + iy$ be a complex number and $\frac{Z+1}{Z-i}$ is purely imaginary, then Z lies on a circle having the equation

(A) $x^2 + y^2 = 1$ (B) $x^2 + y^2 + x - y = 0$

(C) $x^2 + y^2 + x + y = 0$ (D) $x^2 + y^2 + 2x - 2y = 1$

49. The value of $\lim_{x \to 0} \frac{\int_0^x \sin t\, dt}{x^2}$ is

(A) 0 (B) $\frac{1}{2}$

(C) 2 (D) Does not exist

50. If x = cosΘ + i sinΘ, then $x^p + (1/x^p)$ is equal to

(A) 2 tan pΘ (B) 2 sin pΘ

(C) 2 cos pΘ (D) 2 cot pΘ

51. If λ is an equivalent of A with corresponding Eigen vector X, then for any scalar C, X is an Eigen vector of A^2 corresponding to

(A) λ (B) λ^2

(C) $1/\lambda^2$ (D) $1/\lambda$

52. A circle passes through the points (0, 0), (c, 0), (0, d), then the coordinates of its centre are

(A) (d/2, d/2) (B) (c/2, d/2)

(C) (c, d) (D) (d ,c)

53. If a wall 8m high is 11m from a base, then the shortest ladder that will reach from the ground of house to the wall is

(A) 5√5 m (B) 5 m

(C) 11 m (D) None of these

54. If a point $P(4,\ 3)$ is shifted by a distance $\sqrt{2}$ unit parallel to the line y = x then the coordinate of P in new position is

(A) $(5+\sqrt{2},\ 4+\sqrt{2})$ (B) $(5-\sqrt{2},\ 4-\sqrt{2})$

(C) $(5,\ 4)$ (D) $(4+\sqrt{2},\ 3+\sqrt{2})$

55. The coordinates of the foot of the perpendicular drawn from the point $(3, 4)$ on the line 2x + y – 7 = 0 is

(A) $\left(\frac{1}{5}, \frac{17}{5}\right)$ (B) $\left(\frac{9}{5}, \frac{17}{5}\right)$

(C) $\left(\frac{9}{5}, 1\right)$ (D) $\left(\frac{9}{5}, -\frac{17}{5}\right)$

56. What is the value of $\lim_{n\to\infty}$ (1/1+1/2+1/3……..1/n)/n

(A) 0 (B) 1

(C) 2 (D) 3

57. Find the ratio of the major axis to the minor axis of the ellipse: $9x^2 + 4y^2 - 72x - 24y - 144 = 0$

(A) 0.78 (B) 1.5
(C) 0.85 (D) 1.2

58. Let X be a discrete random variable having the following probability mass functions

$x:$	0	1	2	3	4	5	6
$P(X=x):$	0	k	$2k$	$3k$	$4k$	$5k$	$6k$

Then $P(X \geq 4)$ is

(A) $\frac{5}{7}$ (B) $\frac{14}{15}$

(C) $\frac{7}{15}$ (D) $\frac{10}{21}$

59. The rank of the matrix $\begin{bmatrix} 1 & 4 & -1 & 2 \\ 2 & 8 & -2 & 4 \\ -1 & -4 & 1 & -2 \end{bmatrix}$ is

(A) 4 (B) 3
(C) 1 (D) 2

60. Suppose that Z denotes the set of all integers. Then $\left\{ \begin{pmatrix} n & 0 \\ 0 & 0 \end{pmatrix} : n \in Z \right\}$ under addition is

(A) Not a group (B) Not an abelian group
(C) A cyclic group (D) An abelian group but not cyclic

61. If $\hat{x}$ and $\hat{y}$ are two unit vectors and θ is the angle between them, then

(A) $2 \sin\frac{\theta}{2} = |\hat{x} - \hat{y}|$ (B) $2 \sin\frac{\theta}{2} = \pm|\hat{x} - \hat{y}|$

(C) $2 \sin\frac{\theta}{2} = -|\hat{x} - \hat{y}|$ (D) $2 \sin\frac{\theta}{2} = |\hat{x} + \hat{y}|$

62. If $\begin{pmatrix} x+1 & 5 \\ 4 & y-2 \end{pmatrix} = \begin{pmatrix} 3 & 5 \\ 4 & 3 \end{pmatrix}$

Then x and y will be

(A) x = 4, y = 2 (B) x = 2, y = 5
(C) x = 2, y = 4 (D) x = 1, y = 3

63. The triangle formed by the points (0, 7, 10), (-1, 6, 6) and (-4, 9, 6)

(A) Isosceles (B) Right angled
(C) Equilateral (D) None of these

64. Which condition is regained so that straight line y = mx + c is a target to the parabola $y^2 = 4ax$

(A) $c = a/(1+m^2)$ (B) c = - a/m
(C) c = a/m (D) None of these

65. The series $1/e - 2/e^2 + 3/e^3 - 4/e^4 + \ldots\ldots$ is

(A) Divergent (B) Convergent
(C) Conditionally convergent (D) None of these