

Test Booklet Serial No.:

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Total Number of Pages : 36

Number of Questions : 100

**MCMT**

Time Allowed : 3 Hours

Maximum Marks : 400

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1. Each question carries 4 marks. For each correct response the candidate will get 4 marks. For each incorrect answer, 1 mark will be deducted from the total score.
3. Use only HB Pencil for darkening the appropriate circle completely  
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3. Rough work is to be done only on the Test Booklet not on the answer-sheet.
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7. At the end of the examination hand over the answer sheet (ORS) to the invigilator. However, the candidate can take away the test booklet after completion of examination.
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Space for Rough work

1. The domain of function

$$f(x) = \sin^{-1}\left(\log_2\left(\frac{x^2}{2}\right)\right), x \geq 0 \text{ is:}$$

(A)  $[0, 2] - \{0\}$

(B)  $[1, \infty]$

(C)  $[1, 2]$

(D)  $(0, \infty)$

2. The mapping  $f(n) = 2n + 1$  defined on the set of all natural numbers  $N$  is:

(A) one to one and onto

(B) one to one but not onto —

(C) not one to one but onto

(D) neither one to one nor onto

3. The invertible matrices with real entries of the form  $\begin{pmatrix} m & b \\ 0 & 1 \end{pmatrix}$ , where  $m$  is a non zero integer, that commute with the matrix  $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$  is of the form:

(A)  $\begin{pmatrix} m & 0 \\ 0 & 1 \end{pmatrix}$

(B)  $\begin{pmatrix} 0 & b \\ 0 & 1 \end{pmatrix}$

(C)  $\begin{pmatrix} m & m \\ 0 & 1 \end{pmatrix}$

(D)  $\begin{pmatrix} m & m+1 \\ 0 & 1 \end{pmatrix}$

4. If  $(\alpha, \beta, \gamma)$  is a solution of the following system of equations

$$x + y - 2z = 2$$

$$x + 5y + 6z = 7$$

$$x + 3y + 3z = 4$$

then the value of  $\alpha + \beta + \gamma$  is:

(A) 0

(B)  $\frac{3}{2}$

(C) 1

(D)  $-\frac{3}{2}$

5. If  $f(x+y, x-y) = xy$  then the arithmetic mean of  $f(x, y)$  and  $f(y, x)$  is:

(A) 1

(B) 0

(C) x

(D) y

6. Let  $f(x)$  be a continuous function on  $[0, \pi/2]$  such that  $f(x) + f\left(\frac{\pi}{2} - x\right) \neq 0$ , for all  $x$ , then the value of integral

$$\int_0^{\pi/2} \frac{f(x)}{f(x) + f\left(\frac{\pi}{2} - x\right)} dx$$

is:

(A) 0

(B)  $\frac{\pi}{4}$

(C)  $\frac{\pi}{2}$

(D)  $\pi$

7. The range of the function  $f(x) = \frac{x+3}{|x+3|}$ ,  $x \neq -3$  is:

- (A) {1}
- (B) ~~{-1, 1}~~
- (C) ~~{-1, 0, 1}~~
- (D) {-3,  $\infty$ }

8. The value of the sum  $\sum_{n=1}^{100} \frac{n}{n^4 + n^2 + 1}$  is

- (A) 2020/10101
- (B) 3030/10101
- (C) ~~4040/10101~~
- (D) 5050/10101

9. If  $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$  are roots of the equation  $Z^5 - 32 = 0$  then which one is true:

- (A)  $\alpha_i$ 's are collinear
- (B)  ~~$\alpha_i$ 's are concyclic~~
- (C)  ~~$\sum_{i=1}^5 \alpha_i = 32$~~
- (D)  $\sum_{i=1}^5 \alpha_i = 1$

10. Let  $g(x) = \frac{p_0 + p_1x}{1 + qx^2}$ , be such that  $g(0) = 1$ ,  $g'(0) = -1$ , and  $g''(0) = 0$ , then  $g(1)$  is equal to:

- (A) ~~-1~~
- (B) ~~1/2~~
- (C) ~~0~~
- (D) 1

11. If in a group  $G$ ,  $a^7 = e$  and  $a b a^{-1} = b^2$  for  $a, b \in G$  and if  $b \neq e$ , the order of  $b$  is equal to:

- (A) 123
- (B) 125
- (C) 127
- (D) 129

12.  $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ . Then which of the following is NOT correct?

- (A)  $\begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$  is an eigenvector of  $A$ .
- (B)  $\begin{pmatrix} 3 \\ 4 \\ -2 \end{pmatrix}$  is an eigenvector of  $A$ .
- (C)  $\begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$  is an eigenvector of  $A$ .
- (D)  $\begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix}$  is an eigenvector of  $A$ .

13. Let  $u_n = \frac{2^n n!}{n^n}$  and  $v_n = \frac{3^n n!}{n^n}$ . Then  $\{u_n\}$  is mod.

- (A)  $\sum_{n=1}^{\infty} u_n$  and  $\sum_{n=1}^{\infty} v_n$  both are convergent
- (B)  $\sum_{n=1}^{\infty} u_n$  is convergent but  $\sum_{n=1}^{\infty} v_n$  is divergent
- (C)  $\sum_{n=1}^{\infty} u_n$  is divergent but  $\sum_{n=1}^{\infty} v_n$  is convergent
- (D)  $\sum_{n=1}^{\infty} u_n$  and  $\sum_{n=1}^{\infty} v_n$  both are divergent

14.  $\int_0^n [x+1] dx$  is equal to

where  $[n]$  is greatest integer less than or equal to  $n$ .

- ~~(A) 5~~
- ~~(B) 4~~
- ~~(C) 2~~
- ~~(D) 3~~

15. The Argument of the complex number  $\frac{3+2i}{1+3i}$

- (A)  $\tan^{-1}\left(\frac{9}{7}\right)$
- (B)  $-\tan^{-1}\left(\frac{9}{7}\right)$
- (C)  $\tan^{-1}\left(\frac{7}{9}\right)$
- (D)  $-\tan^{-1}\left(\frac{7}{9}\right)$

16. Consider the equation  $z^3 - z^2 - z - 2 = 0$ . Let A be the triangle in the complex plane whose vertices are the roots of this equation. The volume of the solid obtained by revolving the triangle A about real axis is:

- (A)  $\frac{8}{5}\pi$
- (B)  $\frac{5}{8}\pi$
- (C)  $\frac{5}{12}\pi$
- (D)  $\frac{12}{5}\pi$

17. Let  $V$  be the vector space  $\mathbb{R}^4$  over  $\mathbb{R}$ , where  $\mathbb{R}$  denotes the field of reals. Let  $W$  be the subspace of  $V$  spanned by the vectors  $w_1 = (4, 0, 2, 0)$ ,  $w_2 = (2, 2, 0, 0)$ ,  $w_3 = (1, 1, 0, 0)$  and  $w_4 = (5, 1, 2, 0)$ . The dimension of  $W$  over  $\mathbb{R}$  is:

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

18. The solution of the differential equation

$$\cos x \frac{dy}{dx} + y = \sin x, \quad x \in (-\pi/4, \pi/4)$$

is:

- (A)  $y(x) = c \frac{\cos x}{1 + \sin x} + 1 - \frac{x \cos x}{1 + \sin x}$   
(B)  $y(x) = c \frac{\sin x}{1 + \cos x} + 1 - \frac{x \sin x}{1 + \cos x}$   
(C)  $y(x) = c \frac{\cos x}{1 + \sin x} - 1 + \frac{x \cos x}{1 + \sin x}$   
(D)  $y(x) = c \frac{\sin x}{1 + \cos x} - 1 + \frac{x \sin x}{1 + \cos x}$

19. The absolute value of the difference of the slopes with the  $x$ -axis made by the pair of straight lines represented by

$$x^2 (\tan^2 \theta + \cos^2 \theta) - 2xy \tan \theta + y^2 \sin^2 \theta = 0$$

is

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



20. The equation

$$x^2 + 4xy + 3y^2 + 8x + 10y + 6 = 0$$

represents

- (A) a pair of straight lines
- (B) a circle
- (C) a parabola
- (D) a hyperbola

21. Given that  $\alpha$  is not a root of  $ax^2 + bx + c = 0$  then  $\begin{bmatrix} a & b & a\alpha + b \\ b & c & b\alpha + c \\ a\alpha + b & b\alpha + c & 0 \end{bmatrix}$  is not invertible

if:

- (A)  $a, b, c$  are in AP
- (B)  $a, b, c$  are in GP
- (C)  $a, b, c$  are in HP
- (D)  $a + b + c = 0$

22. Let  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$  be the linear mapping defined by  $f(x, y, z) = (x+2y-z, y+z, x+y-2z)$ . Let  $U = \text{Image } T$ . Then dimension of  $U$  equals:

- (A) 0
- (B) 1
- (C) 2
- (D) 3

23. If  $x^3 + ax^2 + bx + c = 0$  has two equal roots then each of them is equal to:

(A)  $\sqrt{\frac{b}{3}}$

(B)  $-\sqrt{\frac{b}{3}}$

(C)  $-\frac{a}{3}$

(D)  $\frac{a}{3}$

24. A chord of the parabola  $y = x^2 - 2x + 5$  joins the points with abscissa  $x_1 = 1, x_2 = 3$ . The equation of the tangent to the parabola parallel to this chord is:

(A)  $4x + 2y - 1 = 0$

(B)  $4x - 2y + 1 = 0$

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

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

25. Let  $A = \begin{pmatrix} 1 & 1 & 1 \\ x & y & z \\ 3 & 3 & 2 \end{pmatrix}$  and  $V = \{(x, y, z) \in \mathbb{R}^3 \mid \det(A) = 0\}$ , where  $\det(A)$  denotes determinant

of  $A$ . Then the dimension of vector space  $V$  over  $\mathbb{R}$  is:

(A) 1

(B) 2

(C) 3

~~(D)~~ 0

26. The value of  $k$  for which the function  $f(x, y) = \begin{cases} kx(x-y), & 0 < x < 2, -x < y < x \\ 0, & \text{otherwise} \end{cases}$  is a joint probability density function of random variable  $(X, Y)$  is:

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

(B)  $\frac{1}{4}$

(C)  $\frac{1}{8}$

(D)  $\frac{1}{16}$

27. If  $y_p(x) = x \cos 2x$  is a particular integral of the differential equation

$$y'' + \alpha y = -4 \sin 2x$$

then the constant  $\alpha$  is equal to

(A)  $-4$

(B)  $-2$

(C)  $4$

(D)  $2$

28. Consider a function  $f(x, y) = \begin{cases} \frac{x^3 + y^3}{x - y}, & x \neq y \\ 0, & \text{otherwise} \end{cases}$

Which of the following is TRUE?

(A)  $f$  is continuous at  $(0, 0)$  but  $f_x(0, 0)$  does not exist.

(B)  $f$  is continuous at  $(0, 0)$  but  $f_y(0, 0)$  does not exist.

(C)  $f$  is discontinuous at  $(0, 0)$  and both  $f_x(0, 0)$ ,  $f_y(0, 0)$  exist.

(D)  $f$  is discontinuous at  $(0, 0)$  and both  $f_x(0, 0)$ ,  $f_y(0, 0)$  fail to exist.

29. The set of real number  $x$  for which the series  $\sum_{n=1}^{\infty} \frac{n!x^{2n}}{n^n(1+x^{2n})}$  converges, is:

(A)  $\{0\}$

(B)  $\{x \mid -1 < x < 1\}$

(C)  $\{x \mid -\sqrt{e} < x < \sqrt{e}\}$

(D)  $\mathbb{R}$

30. The minimum value of the function  $f(x, y, z) = x+4z$  on the surface of the sphere  $x^2+y^2+z^2 = 2$  is

(A)  $-2$

(B)  $-\sqrt{34}$

(C)  $-5\sqrt{2}$

(D)  $-2\sqrt{17}$

31. If  $\vec{a}, \vec{b}, \vec{c}$  are vectors such that  $|\vec{a}| = 1 = |\vec{c}|$  and  $\{(\vec{a} + \vec{b}) \times (\vec{a} + \vec{c})\} \times (\vec{b} + \vec{c}) \cdot (\vec{b} + \vec{c})$  is equal to:

(A)  $-1$

(B)  $0$

(C)  $1$

(D)  $2$

32. If the matrix of a linear transformation  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  with respect to the standard ordered basis of  $\mathbb{R}^3$  over  $\mathbb{R}$  is  $\begin{pmatrix} 1 & 2 & -1 \\ 0 & 1 & 1 \\ 3 & -4 & 2 \end{pmatrix}$ , then the vector of  $T\left(\begin{pmatrix} 2 \\ 3 \\ -2 \end{pmatrix}\right)$  is:

(A)  $\begin{pmatrix} 10 \\ -1 \\ 10 \end{pmatrix}$

(B)  $\begin{pmatrix} -10 \\ 1 \\ 10 \end{pmatrix}$

(C)  $\begin{pmatrix} -4 \\ 15 \\ -5 \end{pmatrix}$

(D)  $\begin{pmatrix} 4 \\ -15 \\ 5 \end{pmatrix}$

33. Let  $f(x) = \begin{cases} x^3 - 1 & 0 < x < 2 \\ 2x^2 + 3 & 2 \leq x < 3 \end{cases}$ . The quadratic equation whose roots are  $\lim_{x \rightarrow 2^-} f'(x)$  and  $\lim_{x \rightarrow 2^+} f'(x)$ , is

(A)  $x^2 - 14x + 48 = 0$

(B)  $x^2 - 20x + 96 = 0$

(C)  $x^2 - 9x + 14 = 0$

(D)  $x^2 - 22x + 14 = 0$

34. A biased coin with probability of obtaining HEAD equal to  $p > 0.5$ , is tossed repeatedly and independently until the first HEAD is observed. The probability that the first HEAD appears at an even numbered toss is:

(A)  $\frac{1+p}{2+p}$

(B)  $\frac{1-p}{2-p}$

(C)  $1-p$

(D)  $p$

35. Let  $(a_n)$  be a real sequence defined by

$$a_1 = \sqrt{2}, a_n = (\sqrt{2})^{2n-1}, n > 1.$$

Consider the following statements:

I.  $(a_n)$  is an increasing sequence.

II.  $(a_n)$  is a divergent sequence.

III.  $(a_n)$  is a convergent sequence and it converges to  $\sqrt{2}$ .

IV.  $(a_n)$  is a convergent sequence and it converges to 2.

Which of the following hold for  $(a_n)$ ?

(A) Only I

(B) Only II

(C) Only I and III

(D) Only I and IV

36.  $\vec{p}, \vec{q}, \vec{r}$  are three unit vectors such that  $\vec{p} \times [\vec{q} \times \vec{r}] = \frac{1}{2}[\vec{q} + \vec{r}]$  if  $\vec{q}$  and  $\vec{r}$  are non-parallel vectors then angle between  $\vec{p}$  and  $\vec{q}$  is:

(A)  $\pi/2$

(B)  $\pi/3$

(C)  $2\pi/3$

(D)  $\pi$

37. The mean and standard deviation of a set of values are 25 and 5 respectively. If a value 5 is added to each value then the coefficient of variation of the new set of values is:

(A) 250%

(B) 600%

(C) 20%

(D) 16.6%

38. In a shooting competition, X can shoot the target 4 out of 5 times. Y can shoot it 5 out of 6 times and Z can shoot it 3 out of 4 times. If all three X, Y, Z are allowed one shot each at a target then the probability that the target is hit at least twice is:

(A)  $\frac{47}{120}$

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

(C)  $\frac{107}{120}$

(D)  $\frac{1}{120}$

39. A continuous random variable X has a probability density function given by

$$f_X(x) = \begin{cases} k(2-x)(x-5), & 2 \leq x \leq 5 \\ 0, & \text{otherwise} \end{cases}$$

The value of mode of distribution of x is:

(A) 2.5

(B) 4.5

(C) 3.5

(D) 0.5

40. The volume of the region bounded by the surface  $z = 1 + y^2$  and the planes  $x = 0$ ,  $y = 0$ ,  $z = 0$  and  $x + y = 1$  is:

(A)  $\frac{1}{12}$

(B)  $\frac{5}{12}$

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

(D)  $\frac{11}{12}$

41. ... The improper integral

$$\int_1^{\infty} \left( \frac{\alpha}{x+1} - \frac{3x}{2x^2 + \alpha} \right) dx$$

- (A) does not converge for any real value of  $\alpha$ .
- (B) converges for all real values of  $\alpha$ .
- (C) converges only when  $\alpha = 1.5$ .
- (D) converges for any real  $\alpha > 1$ .

42. Which of the following statement is TRUE?

- (A)  $y' = x/y$  is a first order linear differential equation
- (B)  $y'' + (y')^3 + y = 0$  is a nonlinear differential equation of order 3
- (C)  $y'' + y' + y = x$  is a homogenous second order differential equation
- (D)  $(\sin x)y'' + (1-x^2)y' + (\cos x)y = 0$  is a second order linear differential equation

43. If  $y(x)$  is a solution of the initial value problem

$$y'' - 4y = 0, y(0) = 4, y'(0) = 4$$

then the value of  $y(1/2)$  is equal to

- (A)  $\frac{3e^2 + 1}{e}$
- (B)  $\frac{e^2 + 3}{e}$
- (C)  $\frac{e^2 + 1}{2e}$
- (D)  $\frac{2(e^2 + 1)}{e}$



44. Consider the differential equation  $x^2 + 2x - 1 - 4yy' = 0$ . Which of the following statement is FALSE?

- (A) It is a first order homogenous equation
- (B) It is a nonlinear differential equation
- (C) It is not an exact differential equation
- (D) It can be solved by separation of variables technique

45. If the velocity  $v(t)$  of a boat is given by  $v'(t) = 200 - 0.5v^2(t)$ ,  $v(t) \geq 0$ , then  $\lim_{t \rightarrow \infty} v(t)$  is:

- (A) 20
- (B)  $\frac{1}{20}$
- (C)  $\frac{1}{40}$
- (D)  $200$

46. If  $r$  stands for modulus of the vector  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ , then  $\text{grad } r$  is equal to:

- (A)  $\frac{\vec{r}}{r^3}$
- (B)  $\frac{\vec{r}}{r^2}$
- (C)  $\frac{\vec{r}}{r}$
- (D)  $\vec{r}$

47. If a line  $x = \alpha$  divides the area bounded by the curve  $y = 1 + (8/x^2)$  and the lines  $x = 2$ ,  $x = 4$  into two equal parts, then the value of  $\alpha$  is:

(A)  $2\sqrt{\frac{2}{3}}$

(B)  $2\sqrt{3}$

(C) 3

(D)  $2\sqrt{2}$

48. For any real  $x$  satisfying  $||3 - x| - |x + 2||$ , the set of values of  $x^2 + 5$  is equal to:

(A)  $[9, \infty)$

(B)  $[5, \infty)$

(C)  $[14, \infty)$

(D)  $[7, \infty)$

49. The differential equation

$$(\sin 2y) \frac{dy}{dx} + 2 \tan x \cos^2 y = 2 \sec x \cos^3 y,$$

can be reduced to a linear differential equation of the form  $\frac{du}{dx} + P(x)u = Q(x)$ , by a simple substitution given by

(A)  $u = \tan y$

(B)  $u = \sec y$

(C)  $u = \cot y$

(D)  $u = \operatorname{cosec} y$

50. The value of  $\int_0^{4/\pi} \int_0^\pi 5(xy + \pi \sin x) dx dy$  is:

(A) -60

(B) -15

(C) 15

(D) 60

Read the passages given below and answer the questions that follow. You have to mark only one answer for each question.

**PASSAGE-1:**

The use of the motor car is becoming more and more widespread in this century. As an increasing number of countries develop both technically and economically, so a large proportion of the world is able to buy and use a car. Possessing a car gives a much greater degree of mobility, enabling the driver to move around freely. The owner of a car is no longer forced to rely on public transport. Travelling to work by car is also more comfortable than having to use public transport. There is no irritation caused by waiting for trains or buses, standing in long patient queues in scorching sun or blinding rain for as long as half an hour sometimes. For the first time in this century also, many people are now able to enjoy their leisure time to the full making trips to the holiday resorts instead of being confined to their immediate neighbourhood. This feeling of independence, and the freedom to go where you please is, perhaps the greatest advantage of the car. When considering the drawbacks, perhaps pollution is of prime importance. As more and more cars are produced and used, so the emission from their exhaust pipes contains an ever larger volume of poisonous gas. Some of the contents of this gas, such as lead, not only pollute the atmosphere but cause actual harm to the health of people.

51. More and more people today are buying and using the car because,

- (A) the car allows them the freedom to go wherever they want to
- (B) they do not have to keep waiting for public transport
- (C) as countries develop technologically and economically, people there can afford to buy cars
- (D) the car has made it possible to enjoy your leisure time

52. The major advantage in having a car is:

- (A) You do not have to depend on public transport to go to work or to holiday resorts
- (B) Travelling to work by car is more comfortable
- (C) The hot sun or the heavy showers do not bother you
- (D) Possessing a car gives a much greater degree of mobility, enabling the driver to move around freely

53. The biggest drawback of the car is:

- (A) Big traffic jams are no longer unusual in big cities
- (B) It is a source of pollution —
- (C) Poisonous gas emissions cause health problems
- (D) None of the above

54. Mark the statement that is NOT true:

- (A) The car has given people a sense of freedom and mobility
- (B) Its main drawback, pollution, outweighs all its advantages —
- (C) Technological and economic progress has boosted car sales in this century
- (D) It has allowed people to enjoy their leisure-time to the full

55. The central idea of the passage can be best summed up in:

- (A) The car has proved to be the greatest boon for modern man
- (B) A car gives you a feeling of independence —
- (C) The car has proved to be both a boon and a bane
- (D) The car's drawbacks make it more of a curse than a blessing

#### PASSAGE-2:

This pace of CO<sub>2</sub> emissions and consequent warming is making it increasingly difficult for ecosystems and species to adapt. Many studies have noted that species across the world are struggling to cope with disruptions in their life cycles – predators and prey, insect pollinators and flowering plants. In 2008, some climate scientists warned that "if humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, ... CO<sub>2</sub> will need to be reduced ... to at most 350 ppm [of atmospheric CO<sub>2</sub>] but likely less than that."

The influence of CO<sub>2</sub> levels on the Earth's temperatures and hence climate over the past 50 million years should make us pause. According to Professor David Archer of the University of Chicago, "The similarity between CO<sub>2</sub> and temperature in [the] Antarctica is jaw-dropping," a causal link he says that's even stronger than that between smoking and lung cancer. Falling CO<sub>2</sub> levels contributed to the formation of ice caps on the Antarctic 34 million years ago. That's why Arctic ice is now the first to go. CO<sub>2</sub> was also one of two big factors in the Earth moving in and out of Ice Age glacials over the past 2.5 million years. It is this regulator of the Earth's temperature that we have been shortsightedly fiddling with, and pushed beyond the realm of human experience.

56. 'This pace of CO<sub>2</sub> emissions and consequent warming is making it increasingly difficult for ecosystems and species to adapt' means:

- (A) Ecosystems and species are finding it difficult to change their lifestyle
- (B) They do not find it easy to accept the changes demanded by rising CO<sub>2</sub> emissions—
- (C) Both living and non-living world are changing
- (D) CO<sub>2</sub> emissions are making life difficult for everyone

57. 'Ecosystem' means:

- (A) All the living things on this planet
- (B) The relationship between man and nature
- (C) The interdependence of animate and inanimate world
- (D) All the living things and the way they affect each other and the environment

58. The climate scientists have been warning that CO<sub>2</sub> emissions must be reduced,

- (A) for the earth to continue to exist
- (B) to bring down rising temperatures
- (C) to save the ecosystem from collapsing
- (D) if the earth is to continue to support life as we know it

59. Mark the statement that is NOT true:

- (A) CO<sub>2</sub> levels were responsible both for the coming of the Ice Ages and their end
- (B) A large number of biological organisms have been affected by rising CO<sub>2</sub> emissions
- (C) CO<sub>2</sub> levels have been directly responsible for the rise in temperatures on the earth for 50 million years —
- (D) If life has to continue to flourish on earth, CO<sub>2</sub> levels must not go beyond 350 ppm

60. Mark the statement that most appropriately sums up the passage:

- (A) Many studies have noted that species across the world are struggling to cope with disruptions in their life cycles
- (B) The influence of CO<sub>2</sub> levels on the Earth's temperatures and hence climate over the past 50 million years should make us pause
- (C) The similarity between CO<sub>2</sub> and temperature in [the] Antarctica is jaw-dropping
- (D) This pace of CO<sub>2</sub> emissions and consequent warming is making it increasingly difficult for ecosystems and species to adapt

### PASSAGE-3:

Environmentally, plastics have a good deal to recommend them. Plastic requires only one-tenth of the energy required to produce aluminium, and in spite of the enormous volume involved, plastic accounts for only five per cent of U.S. petroleum consumption. But plastics also present some special problems. Although the basic resin-manufacturing process presents a much cleaner face than a steel mill (there is little smoke and soot), it is also true that many of the ingredients are dangerous. Benzene, for example, which goes into the manufacture of styrene, epoxy, polyester and nylon, is a member of the dangerous family of carcinogens. Common types of plastic produce toxic gases in fires, including hydrogen cyanide and hydrogen chloride. The plastics industry counter-argues that natural materials such as wood also produce toxic gases when burned, and that non-plastics may be more prone to catching fire or starting fires (as in the case of metal electrical housings). Carbon-reinforced plastics create a particular problems – when burned, they release clouds of tiny fibres that can get into electrical equipment and cause short circuits.

61. 'Plastic requires only one-tenth of the energy required to produce aluminium' implies:

- (A) Plastic uses much less energy to produce aluminium than the conventional materials
- (B) Aluminium requires more energy to produce than does plastic —
- (C) Plastic production requires more energy than aluminium production
- (D) None of the above

62. Plastic production scores over steel production as:

- (A) it is less polluting
- (B) it uses less energy
- (C) it is cost-effective
- (D) all of the above —

63. Benzene is considered to be dangerous because

- (A) it produces toxic gases in fires
- (B) it can cause cancer —
- (C) it is poisonous
- (D) it can easily catch fire

64. Mark the statement that is NOT true:

- (A) Benzene is one of the ingredients used in the manufacture of plastic
- (B) Wood also produced toxic gases like some common types of plastic
- (C) Carbon-reinforced plastics can sometimes cause short circuits
- (D) Natural materials such as wood are more dangerous than plastics —

65. Mark the statement that most appropriately sums up the passage:

- (A) Plastics have many advantages but they have very many drawbacks as well —
- (B) Plastics have more drawbacks than advantages
- (C) Plastics are economical to produce but they are far more dangerous in use than conventional materials
- (D) None of the above

PASSAGE-4: Games and sports should be an essential part of our school curriculum. Unfortunately, the emphasis in our schools and colleges has been, by and large, on academics alone. Most administrators and academicians think that games and sports should be meant for those who have an aptitude for these. For that matter, academic learning should also be limited to those who have the capacity to learn. We know this logic does not hold good. Again, some people feel that games and sports hamper academic performance. Those who think on these lines, perhaps, equate the pursuit of games and sports with achieving proficiency and excellence. This is not the truth, of course. The purpose is to keep you physically fit and mentally alert. We should not, therefore, underestimate the value of sports and games in the larger interests of our national growth.

66. Which of the following statements is TRUE?

- (A) The emphasis in our schools has been on academics alone
- (B) The emphasis has been both on academics and sports
- (C) Sports are given their fair share of importance
- (D) The emphasis on sports has been much less than that on academics —

67. Schools give greater importance to academics because they think

- (A) Sports are meant for those who have an aptitude for them —
- (B) Academic learning is for those who have the capacity to learn
- (C) Sports are of no use in developing our minds
- (D) The schools are meant for academic learning and not games and sports



68. Games are important for students because:

- (A) They help them in sharpening their minds —
- (B) They help them in achieving proficiency and excellence
- (C) They advance their career prospects
- (D) They develop an individual's overall personality

69. Mark the statement which most appropriately sums up the passage:

- (A) Games and sports should be compulsory for everyone in the school —
- (B) The emphasis, so far, in our schools and colleges has generally been on academics alone
- (C) It is wrong to equate the pursuit of games and sports with achieving proficiency and excellence
- (D) We should not underestimate the value of sports and games in the larger interests of our national growth

70. 'Those who think on these lines, perhaps, equate the pursuit of games and sports with achieving proficiency and excellence', means:

- (A) Some people wrongly consider sports to be as useful as academics
- (B) It is wrong to think that sports are not as important as academics
- (C) Some people think that the goal of sports, like that of academics, is to achieve excellence
- (D) None of the above —

71. Which of the given options will complete the given series?

A Z B Y C ?

- (A) D
- (B) Y

72. Find the missing number in the series?

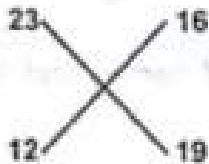
49, 16, 25, 36, 9, ?  
D 4 T C 3

- (A) 64 —
- (B) 52
- (C) 45
- (D) 100

73. If FACE is coded as GBDF, then BADE will be coded as:

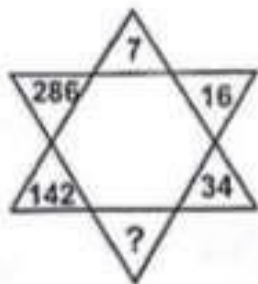
- (A) CBEF —
- (B) CEBF
- (C) CFBE
- (D) CBFE

74. Choose the correct number at the sign of interrogation?



- (A) 6 —
- (B) 8
- (C) 7
- (D) 3

75. Fill the correct number at the sign of interrogation?



- (A) 70  
(B) 68  
(C) 56  
(D) 92
76. Manoj left home for the bus stop 15 minutes earlier than the usual time. It takes 10 minutes to reach the stop. He reached the stop at 8:40 A.M. What time does he usually leave home for the bus stop?
- (A) 8:30 A.M.  
(B) 8:55 A.M.  
(C) 8:45 A.M.  
(D) Data inadequate
77. If a number is five times as great as another number which is four less than 40, then the number is:
- (A) 220  
(B) 180  
(C) 144  
(D) 200

78. If '+' stands for 'x'; 'x' stands for '+'; '+' stands for '-' and '-' stands for '+' then  
 $2 - 8 \times 2 + 6 + 7 = ?$

(A) 32

(B) 19

(C) 23

(D) 9

79. A steamer, going down stream in a river, covers the distance between two towns in 20 hours. Coming back up stream, it covers this distance in 25 hours. The speed of water is 4 km/hr, find the distance between the two towns:

(A) 400 km

(B) 600 km

(C) 800 km

(D) None of these

80. The population of a town increases by 5% annually. If it is 15435 now, find the population 2 years ago?

(A) 8400

(B) 12100

(C) 14000

(D) 14400

81. A dishonest dealer professes to sell his goods at cost price, but he uses a weight of 960 grams for 1 kg. Find the gain percent.

(A) 4%

(B)  $\frac{25}{3}\%$

(C)  $\frac{28}{3}\%$

(D) None of these

82. A father said to his son "I was as old as you are at present at the time of your birth". If the father's age is 38 years now, the son's age five years back was?

(A) 14 years

(B) 19 years

~~(C)~~ 33 years

(D) 16 years

83. In the first 10 overs of a cricket game, 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) 7

(B) 6.75

(C) 6.50

~~(D)~~ 6.25

84. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

(A) 105

(B) 210

(C) 214

(D) 2520

85. A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

- (A)  $\frac{1}{3}$
- (B)  $\frac{1}{4}$
- (C)  $\frac{1}{5}$
- (D)  $\frac{1}{6}$

86. Convert the binary number 1001.0010 to decimal.

- (A) 90.125
- (B) 9.125
- (C) 125
- (D) 12.5

87. Represent  $-77.25$  in 8-bit 1's complement form.

- (A) 10110010.0111
- (B) 01001101.0100
- (C) 10110010.1011
- (D) 01001101.1011

88. Divide  $(4570.32)_8$  by  $(6)_8$ .

- (A) quotient is  $(624.042)_8$  and remainder is  $(4)_8$
- (B) quotient is  $(624.42)_8$  and remainder is  $(4)_8$
- (C) quotient is  $(624.24)_8$  and remainder is  $(4)_8$
- (D) None of these

89. The output of a NOR gate is HIGH if .....

- (A) all inputs all high
- (B) any input is high
- (C) any input is low
- (D) all inputs are low

90. Applying De Morgan's theorem to the expression  $\overline{ABC}$ , we get .....

- (A)  $\overline{A} + \overline{B} + \overline{C}$
- (B)  $\overline{A + B + C}$
- (C)  $A(B+C)$
- (D)  $A\overline{B} + B\overline{C} + C\overline{A}$

91. Reduction of  $AB + A\overline{B}C + \overline{A}B\overline{C} + B\overline{C}$  using Karnaugh Map is:

- (A)  $A\overline{C} + BC$
- ~~(B)  $AC + B\overline{C}$~~
- ~~(C)  $A\overline{C} + B\overline{C}$~~
- (D)  $AC + BC$

92. If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable?

- (A) .
- (B) &
- (C) \*
- (D) →

93. What would be the equivalent pointer expression for referring the array element  $a[i][j][k]$ ?

- (A)  $((a+i)+j)+k$
- (B)  $*(*((a+i)+j)+k)$
- (C)  $*((a+i)+j)+k$  —
- (D)  $((a+i)+j)+k$

94. Which function should be used to free the memory allocated by `calloc ( )` ?

- (A) `de alloc ( )`
- (B) `malloc (variable_name, 0)`
- (C) `free( )`
- (D) `memalloc (variable_name, 0)`

95. Which of the following is not a logical operator?

- (A) `&` —
- (B) `&&`
- (C) `||`
- ~~(D)~~ `!`



```
#include <stdio.h>
void fun (int*, int*)
int main ( )
{
int i=5, j=2;
fun (&i, &j);
printf("%d,%d", i,j);
return 0;
}
void fun (int * i, int * j )
{
*i = *i**i;
*j = *j**j;
}
```

- (A) 5, 2
- (B) 10, 4
- (C) 25, 4
- (D) None of these

97. In which order do the following operations get evaluated:

- i. Relational
  - ii. Arithmetic
  - iii. Logical
  - iv. Assignment
- (A) ii, i, iii, iv
  - (B) i, ii, iii, iv
  - (C) iv, iii, ii, i
  - (D) iii, ii, i, iv

98. The brain of any computer system is:

- (A) ALU
- (B) Memory
- (C) CPU
- (D) Control Unit

99. Which kind of devices allows the user to add components and capabilities to a computer system?

- (A) System Boards
- (B) Storage Devices
- (C) Input Devices
- (D) Expansion slots

100. Which of the following require large computer memory?

- (A) Imaging
- (B) Graphics
- (C) Voice
- (D) All of the above