## General Instructions :

(i) Section A will have 15 questions covering both i.e., Mathematics/Applied Mathematics which will be compulsory for all candidates.
(ii) Section B1 will have 35 questions from Mathematics out of which 25 questions need to be attempted. Section B2 will have 35 questions purely from Applied Mathematics out of which 25 questions will be attempted.
(iii) Correct answer or the most appropriate answer: Five marks (+5)
(iv) Any incorrect option marked will be given minus one mark ( -1 ).
(v) Unanswered/Marked for Review will be given no mark (0).
(vi) If more than one option is found to be correct then Five marks (+5) will be awarded to only those who have marked any of the correct options.
(vii) If all options are found to be correct then Five marks (+5) will be awarded to all those who have attempted the question.
(viii) If none of the options is found correct or a Question is found to be wrong or a Question is dropped then all candidates who have appeared will be given five marks (+5).
(ix) Calculator / any electronic gadgets are not permitted.

## Section - A

## Mathematics/Applied Mathematics

1. If $f(x)=\left\{\begin{array}{l}m x+1 \text { if } x \leq \frac{\pi}{2} \\ \sin x+n, \text { if } x>\frac{\pi^{\prime}}{2}\end{array}\right.$ is continuous at $x=\frac{\pi}{2}$ then
(1) $m=1, n=0$
(2) $m=\frac{n \pi}{2}+1$
(3) $n=\frac{m \pi}{2}$
(4) $m=n=\frac{\pi}{2}$
2. If $\left|\begin{array}{lll}2 & 3 & 2 \\ x & x & x \\ 4 & 9 & 1\end{array}\right|+3=0$, then the value of $x$ is
(1) 3
(2) 0
(3) -1
(4) 1

Directions: In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is NOT the correct explanation of A
(C) $A$ is true but $R$ is false
(D) A is false and $R$ is True
3. Assertion (A): $\int_{0}^{\pi / 2} \frac{\cos x}{\sin x+\cos x} d x=\frac{\pi}{4}$

Reason (R): $\int_{0}^{\pi / 2} \frac{\sin x}{\sin x+\cos x} d x=\frac{\pi}{4}$
4. Assertion (A): $\frac{d}{d x}\left[\int_{0}^{x^{2}} \frac{d t}{t^{2}+4}\right]=\frac{2 x}{x^{4}+4}$

Reason (R): $\int \frac{d x}{x^{2}+a^{2}}=\frac{1}{a} \tan ^{-1}\left(\frac{x}{a}\right)+c$
5. Let $T$ be the set of all triangles in the Euclidean plane, and let $a$ relation $R$ on $T$ be defined as $a R b$ if $a$ is congruent to $b \forall a, b \in T$. Then $R$ is
(1) reflexive but not transitive
(2) transitive but not symmetric
(3) equivalence relation
(4) None of these
6. The area of the region bounded by the $y$-axis, $y=\cos x$ and $y=\sin x, 0 \leq x \leq \pi / 2$ is
(1) $\sqrt{2}$ sq. units
(2) $(\sqrt{2}+1)$ sq. units
(3) $(\sqrt{2}-1)$ sq. units
(4) $(2 \sqrt{2}-1)$ sq. units
7. A ladder, 5 metre long, standing on a horizontal floor, leans against a vertical wall. If the top of the ladder slides downwards at the rate of $10 \mathrm{~cm} / \mathrm{sec}$, then the rate at which the angle between the floor

## MATHEMATICS/APP. MATH.

and the ladder is decreasing when lower end of ladder is 2 metre from the wall is :
(1) $\frac{1}{10} \mathrm{radian} / \mathrm{sec}$
(2) $\frac{1}{20}$ radian $/ \mathrm{sec}$
(3) $20 \mathrm{radian} / \mathrm{sec}$
(4) $10 \mathrm{radian} / \mathrm{sec}$
8. If $A$ and $B$ are two events such that $P(A) \neq 0$ and $P(B \mid A)=1$, then
(1) $A \subset B$
(2) $B \subset A$
(3) $B=\varphi$
(4) $A=\varphi$
9. The value of $\sin ^{-1}\left(\cos \frac{3 \pi}{5}\right)$ is
(1) $\frac{\pi}{10}$
(2) $\frac{3 \pi}{5}$
(3) $-\frac{\pi}{10}$
(4) $\frac{-3 \pi}{5}$
10. If $P(A \mid B)>P(\mathrm{~A})$, then which of the following is correct:
(1) $P(B \mid A)<P(B)$
(2) $P(A \cap B)<P(\mathrm{~A}) \cdot P(\mathrm{~B})$
(3) $P(B \mid A)>P(B)$
(4) $P(B \mid A)=P(B)$
11. The equation of normal to the curve $3 x^{2}-y^{2}=8$ which is parallel to the line $x+3 y=8$ is
(1) $3 x-y=8$
(2) $3 x+y+8=0$
(3) $x+3 y \pm 8=0$
(4) $x+3 y=0$
12. Consider the non-empty set consisting of children
in a family and a relation $R$ defined as $a R b$ if $a$ is brother of $b$. Then $R$ is
(1) symmetric but not transitive
(2) transitive but not symmetric
(3) neither symmetric nor transitive
(4) both symmetric and transitive
13. The corner points of the feasible region determined by the system of linear constraints are $(0,0),(0,40)$, $(20,40),(60,20),(60,0)$. The objective function is $Z=4 x+3 y$.
Compare the quantity in Column $A$ and Column $B$

| Column $A$ | Column $B$ |
| :---: | :--- |
| Maximum of $Z$ | 325 |

(1) The quantity in column $A$ is greater.
(2) The quantity in column $B$ is greater.
(3) The two quantities are equal.
(4) The relationship cannot be determined on the basis of the information supplied.
14. The value of $\int_{-\pi / 2}^{\pi / 2}\left(x^{3}+x \cos x+\tan ^{5} x+1\right) d x$ is
(1) 0
(2) 2
(3) $\pi$
(4) 1
15. Distance of the point $(\alpha, \beta, \gamma)$ from $y$-axis is
(1) $\beta$
(2) $|\beta|$
(3) $|\beta|+|\gamma|$
(4) $\sqrt{\alpha^{2}+\gamma^{2}}$

## Section - B1

## Mathematics

16. The value of $\sin ^{-1}\left[\cos \left(\frac{33 \pi}{5}\right)\right]$ is
(1) $\frac{3 \pi}{5}$
(2) $\frac{-7 \pi}{5}$
(3) $\frac{\pi}{10}$
(4) $\frac{-\pi}{10}$
17. If $y=\log _{e}\left(\frac{x^{2}}{e^{2}}\right)$, then $\frac{d^{2} y}{d x^{2}}$ equals
(1) $-\frac{1}{x}$
(2) $-\frac{1}{x^{2}}$
(3) $\frac{2}{x^{2}}$
(4) $-\frac{2}{x^{2}}$
18. If the curve $a y+x^{2}=7$ and $x^{3}=y$, cut orthogonally at $(1,1)$, then the value of $\boldsymbol{a}$ is :
(1) 1
(2) 0
(3) -6
(4) 6
19. Let $A=\left[\begin{array}{cc}200 & 50 \\ 10 & 2\end{array}\right]$ and $B=\left[\begin{array}{cc}50 & 40 \\ 2 & 3\end{array}\right]$, then $|A B|$ is equal to
(1) 460
(2) 2000
(3) 3000
(4) -7000
20. If $A$ and $B$ are any two events such that $P(\mathrm{~A})+P(\mathrm{~B})-P(A$ and $B)=P(\mathrm{~A})$, then
(1) $P(B \mid A)=1$
(2) $P(A \mid B)=1$
(3) $P(B \mid A)=0$
(4) $P(B \mid A)=0$
21. The sine of the angle between the straight line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ and the plane $2 x-2 y+z=5$ is
(1) $\frac{10}{6 \sqrt{5}}$
(2) $\frac{4}{5 \sqrt{2}}$
(3) $\frac{2 \sqrt{3}}{5}$
(4) $\frac{\sqrt{2}}{10}$
22. The area of the region bounded by the curve $x^{2}=4 y$ and the straight-line $x=4 y-2$ is
(1) $\frac{3}{8}$ sq. units
(2) $\frac{5}{8}$ sq. units
(3) $\frac{7}{8}$ sq. units
(4) $\frac{9}{8}$ sq. units
23. The value of determinant $\left|\begin{array}{lll}a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c\end{array}\right|$ is
(1) $a^{3}+b^{3}+c^{3}$
(2) $3 b c$
(3) $a^{3}+b^{3}+c^{3}-3 a b c$
(4) None of these
24. In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs, none is defective is
(1) $10^{-1}$
(2) $\left(\frac{1}{2}\right)^{5}$
(3) $\left(\frac{9}{10}\right)^{5}$
(4) $\frac{9}{10}$
25. The degree of the differential equation $\left(\frac{d^{2} y}{d x^{2}}\right)^{2}+\left(\frac{d y}{d x}\right)^{2}=x \sin \left(\frac{d y}{d x}\right)$ is
(1) 1
(2) 2
(3) 3
(4) not defined
26. The set of points where the function $f$ given by $f(x)=|2 x-1| \sin x$ is differentiable is
(1) $R$
(2) $R-\left\{\frac{1}{2}\right\}$
(3) $(0, \infty)$
(4) none of these
27. The equation of tangent to the curve $y\left(1+x^{2}\right)=2-x$, where it crosses $x$-axis is :
(1) $x+5 y=2$
(2) $x-5 y=2$
(3) $5 x-y=2$
(4) $5 y+x=2$
28. If a relation $R$ on the set $\{1,2,3\}$ be defined by $R=\{(1,2)\}$, then $R$ is
(1) reflexive
(2) transitive
(3) symmetric
(4) None of these
29. The distance of the plane $\vec{r} \cdot\left(\frac{2}{7} \hat{i}+\frac{3}{7} \hat{j}-\frac{6}{7} \hat{k}\right)=1$ from the origin is
(1) 1
(2) 7
(3) $\frac{1}{7}$
(4) None of these
30. The value of $\tan \left[\frac{1}{2} \cos ^{-1}\left(\frac{\sqrt{5}}{3}\right)\right]$ is
(1) $\frac{3+\sqrt{5}}{2}$
(2) $\frac{3-\sqrt{5}}{2}$
(3) $\frac{-3+\sqrt{5}}{2}$
(4) $\frac{-3-\sqrt{5}}{2}$
31. $\int \frac{\cos 2 x}{(\sin x+\cos x)^{2}} d x$ is equal to
(1) $\frac{-1}{\sin x+\cos x}+C$
(2) $\log |\sin x+\cos x|+C$
(3) $\log |\sin x-\cos x|+C$
(4) $\frac{1}{(\sin x+\cos x)^{2}}$
32. The maximum number of equivalence relations on the set $\mathrm{A}=\{1,2,3\}$ are
(1) 1
(2) 2
(3) 3
(4) 5
33. The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is
(1) 1
(2) 2
(3) 5
(4) $\frac{8}{3}$
34. If $y=e^{-x}(A \cos x+B \sin x)$, then $y$ is a solution of
(1) $\frac{d^{2} y}{d x^{2}}+2 \frac{d y}{d x}=0$
(2) $\frac{d^{2} y}{d x^{2}}-2 \frac{d y}{d x}+2 y=0$
(3) $\frac{d^{2} y}{d x^{2}}+2 \frac{d y}{d x}+2 y=0$
(4) $\frac{d^{2} y}{d x^{2}}+2 y=0$
35. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is
(1) 0
(2) $\frac{1}{3}$
(3) $\frac{1}{12}$
(4) $\frac{1}{36}$
36. Let $\vec{a}, \vec{b}$, and $\vec{c}$ be three unit vectors, out of which vectors $b$ and $c$ are non-parallel. If $\alpha$ and $\beta$ are the angles which vector $a$ makes with vectors $b$ and $c$ respectively and $\vec{a} \times(\vec{b} \times \vec{c})=\frac{\vec{b}}{2}$, then $|\vec{\alpha}-\vec{\beta}|$ is equal to :
(1) $30^{\circ}$
(2) $90^{\circ}$
(3) $60^{\circ}$
(4) $45^{\circ}$
37. The distance of the point having position vector $-\hat{i}+2 \hat{j}+6 \hat{k}$ from the straight line passing through the point $(2,3,-4)$ and parallel to the vector $6 \hat{i}+3 \hat{j}-4 \hat{k}$ is :
(1) 7
(2) $4 \sqrt{3}$
(3) $2 \sqrt{13}$
(4) 6
38. If $y=\log \left(\frac{1-x^{2}}{1+x^{2}}\right)$, then $\frac{d y}{d x}$ is equal to
(1) $\frac{4 x^{3}}{1-x^{4}}$
(2) $\frac{-4 x}{1-x^{4}}$
(3) $\frac{1}{4-x^{4}}$
(4) $\frac{-4 x^{3}}{1-x^{4}}$
39. Let $\vec{a}=3 \hat{i}+2 \hat{j}+2 \hat{k}$ and $\vec{b}=\hat{i}+2 \hat{j}-2 \hat{k}$ be two vectors. If a vector perpendicular to both the vectors $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ has the magnitude 12 then one such vector is :
(1) $4(2 \hat{i}-2 \hat{j}-\hat{k})$
(2) $4(2 \hat{i}-2 \hat{j}+\hat{k})$
(3) $4(2 \hat{i}+2 \hat{j}+\hat{k})$
(4) $4(2 \hat{i}+2 \hat{j}-\hat{k})$
40. The sum of the distinct real values of $\mu$, for which the vectors, $\mu \hat{i}+\hat{j}+\hat{k}, \hat{i}+\mu \hat{j}+\hat{k}, \hat{i}+\hat{j}+\mu \hat{k}$ are coplanar, is :
(1) -1
(2) 0
(3) 1
(4) 2
41. The feasible solution for a LPP is shown in given figure. Let $Z=3 x-4 y$ be the objective function Minimum of $Z$ occurs at

(1) $(0,0)$
(2) $(0,8)$
(3) $(5,0)$
(4) $(4,10)$
42. Let $\vec{\alpha}=(\lambda-2) a+b$ and $\vec{\beta}=(4 \lambda-2) a+3 b$ be two given vectors where $a$ and $b$ are non collinear. The value of $\lambda$ for which vectors $\vec{\alpha}$ and $\vec{\beta}$ are collinear, is :
(1) -4
(2) -3
(3) 4
(4) 3
43. Let $f(x)=|\sin x|$, then
(1) $f$ is everywhere differentiable
(2) $f$ is everywhere continuous but not differentiable at $x=n \pi, n \in Z$.
(3) $f$ is everywhere continuous but not differentiable at $x=(2 n+1) \frac{\pi}{2}, n \in Z$.
(4) none of these
44. The integrating factor of differential equation
$\cos x \frac{d y}{d x}+y \sin x=1$ is
(1) $\cos x$
(2) $\tan x$
(3) $\sec x$
(4) $\sin x$
45. If the direction cosines of a line are $k, k, k$, then
(1) $k>0$
(2) $0<k<1$
(3) $k=1$
(4) $k=\frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}$
46. The area of a triangle with vertices $(-3,0),(3,0)$ and $(0, k)$ is 9 sq . units. Then, the value of $k$ will be
(1) 9
(2) 3
(3) -9
(4) 6
47. Refer to $Q .41$ maximum of $Z$ occurs at
(1) $(5,0)$
(2) $(6,5)$
(3) $(6,8)$
(4) $(4,10)$

Read the following text and answer the following questions on the basis of the same:
On her birthday, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got $₹ 10$ more. However, if there were 16 children more, everyone would have got $₹ 10$ less. Let the number of children be $x$ and the amount distributed by Seema for one child be $y$ (in ₹).

48. The equations in terms of $x$ and $y$ are
(1) $5 x-4 y=40$
(2) $5 x-4 y=40$
$5 x-8 y=-80$ $5 x-8 y=80$
(3) $5 x-4 y=40$
$5 x+8 y=-80$
(4) $5 x+4 y=40$ $5 x-8 y=-80$
49. Which of the following matrix equations represent the information given above?
(1) $\left[\begin{array}{ll}5 & 4 \\ 5 & 8\end{array}\right]\left[\begin{array}{l}x \\ y\end{array}\right]=\left[\begin{array}{r}40 \\ -80\end{array}\right]$
(2) $\left[\begin{array}{ll}5 & -4 \\ 5 & -8\end{array}\right]\left[\begin{array}{l}x \\ y\end{array}\right]=\left[\begin{array}{l}40 \\ 80\end{array}\right]$
(3) $\left[\begin{array}{ll}5 & -4 \\ 5 & -8\end{array}\right]\left[\begin{array}{l}x \\ y\end{array}\right]=\left[\begin{array}{r}40 \\ -80\end{array}\right]$
(4) $\left[\begin{array}{rr}5 & 4 \\ 5 & -8\end{array}\right]\left[\begin{array}{l}x \\ y\end{array}\right]=\left[\begin{array}{r}40 \\ -80\end{array}\right]$
50. The number of children who were given some money by Seema, is
(1) 30
(2) 40
(3) 23
(4) 32

## Section - B2

## Applied Mathematics

16. If $a \equiv b(\bmod n)$, then
(1) $n \mid a$ and $n \mid b$
(2) $n \mid b$ only
(3) $n \mid(a-b)$
(4) None of these
17. Evaluate: $(9+23) \bmod 12=\ldots \ldots$.
(1) 2
(2) 8
(3) 32
(4) 12
18. If $B>A$, then which expression will have the highest value, given that $A$ and $B$ are positive integers.
(1) $A-B$
(2) $A \times B$
(3) $A+B$
(4) Can't say
19. Tea worth $₹ 126$ per kg and $₹ 135$ per kg are mixed with a third variety in the ratio $1: 1: 2$. If the mixture
per kg will be:
(1) ₹ 169.50
(2) ₹ 170
(3) ₹ 175.50
(4) ₹ 180
20. $A=\left[a_{\mathrm{if}}\right]_{m \times n}$ is a square matrix, if
(1) $m<n$
(2) $m>n$
(3) $m=n$
(4) None of these
21. If $A$ is a square matrix such that $A^{2}=A$, then $(\mathrm{I}+A)^{3}-7 A$ is equal to
(1) A
(2) $\mathrm{I}-\mathrm{A}$
(3) I
(4) 3 A
22. Which of the given values of $x$ and $y$ make the following pair of matrices equal
$\left[\begin{array}{cc}3 x+7 & 5 \\ y+1 & 2-3 x\end{array}\right],\left[\begin{array}{cc}0 & y-2 \\ 8 & 4\end{array}\right]$
(1) $x=\frac{-1}{3}, y=7$
(2) Not possible to find
(3) $y=7, x=\frac{-2}{3}$
(4) $x=\frac{-1}{3}, y=\frac{-2}{3}$
23. Assume $X, Y, Z, W$ and $P$ are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$, respectively. The restriction on $n, k$ and $p$ so that $P Y+W Y$ will be defined are:
(1) $k=3, p=n$
(2) $k$ is arbitrary, $p=2$
(3) $p$ is arbitrary, $k=3$
(4) $k=2, p=3$
24. If $A$ and $B$ are symmetric matrices of same order, $A B-B A$ is $a:$
(1) Skew-symmetric matrix
(2) Symmetric matrix
(3) Zero matrix
(4) Identity matrix
25. The function $f(x)=2 x^{3}-3 x^{2}-12 x+4$, has
(1) two points of local maximum
(2) two points of local minimum
(3) one maxima and one minima
(4) no maxima or minima
26. The total revenue in Rupees received from the sale of $x$ units of a product is given by $R(x)=3 x^{2}+26 x+15$. The marginal revenue, when $x=15$ is :
(1) ₹ 100
(2) ₹ 116
(3) ₹ 123
(4) None
27. The maximum profit that a company can make, if the profit function is given by $p(x)=41-72 x-18 x^{2}$ is :
(1) 111
(2) 112
(3) 113
(4) 114
28. If $y=x^{3} \log x$, then $\frac{d^{4} y}{d x^{4}}$ is :
(1) $6 x$
(2) $\frac{6}{x}$
(3) $\frac{x}{6}$
(4) $\log 6$
29. If $x$ is real, the minimum value of $x^{2}-8 x+17$ is
(1) -1
(2) 0
(3) 1
(4) 2
30. A candidate claims $70 \%$ of the people in her constituency would vote for her. If 1,20,000 valid votes are polled, then the number of votes she expects from her constituency is
(1) 100000
(2) 84000
(3) 56000
(4) 36000
31. Given that $x=a t^{2}$ and $y=2 a t$ then $\frac{d^{2} y}{d x^{2}}$ is
(1) $\frac{-1}{2 a t^{3}}$
(2) $\frac{-1}{2 a t^{2}}$
(3) $\frac{1}{t^{2}}$
(4) $\frac{-2 a}{t}$
32. The expectation of a random variable $X$ (continuous or discrete) is given by. $\qquad$
(1) $\sum X f(x), \int X f(X)$
(2) $\sum X^{2} f(X), \int X^{2} f(X)$
(3) $\Sigma f(X), \int f(X)$
(4) $\sum X f\left(X^{2}\right), \int X f\left(X^{2}\right)$
33. Mean of a constant ${ }^{\prime} a^{\prime}$ is $\qquad$
(1) 0
(2) $a$
(3) $a / 2$
(4) 1
34. Find the expectation of a random variable $X$.

| $\boldsymbol{X}$ | 0 | 1 | 2 | 3 |
| :---: | :--- | :---: | :---: | :---: |
| $\boldsymbol{f}(\boldsymbol{X})$ | $\frac{1}{6}$ | $\frac{2}{6}$ | $\frac{2}{6}$ | $\frac{1}{6}$ |
| $\mathbf{( 1 )} 0.5$ | (2) 1.5 |  |  |  |
| (3) 2.5 | (4) 3.5 |  |  |  |

35. Skewness of Normal distribution is $\qquad$
(1) Negative
(2) Positive
(3) 0
(4) Undefined
36. Which of the following values is used as a summary measure for a sample, such as a sample mean?
(1) Population Parameter
(2) Sample Parameter
(3) Sample Statistic
(4) Population mean
37. A simple random sample consist of four observation $1,3,5,7$. What is the point estimate of population standard deviation?
(1) 2.3
(2) 2.52
(3) 0.36
(4) 0.4
38. A price index which is based on the prices of the items in the composite, weighted by their relative index is called:
(1) price relatives
(2) Consumer price index
(3) Weighted aggregative price index
(4) Simple aggregative index
39. Which of the following is an example of line series problem?
(i) Estimating numbers of hotel rooms booking in next 6 months.
(ii) Estimating the total sales in next 3 years of an insurance company.
(iii) Estimating the number of calls for the next one week.
(1) Only (iii)
(2) (i) and (ii)
(3) (i), (ii) and (iii)
(4) (ii) and (iii)
40. In Paasche's price index number weight is considered as
(1) Quantity in base year
(2) Quantity in current year
(3) Prices in base year
(4) Prices in current year
41. Moving average method is used for measurement of trend when:
(1) Trend is linear
(2) Trend is non-linear
(3) Trend is curvilinear
(4) None of these
42. The present value of a sequence of payment of $₹ 1000$ made at the end of every 6 months and continuing forever, if money is worth $8 \%$ per annum compounded semi-annually is
(1) 1000
(2) 2500
(3) 25,000
(4) 15,000
43. Assume that Shyam holds a perpetual bond that generates an annual payment of ₹ 500 each year. He believes that the borrower is creditworthy and that an $8 \%$ interest rate will be suitable for this bond. The present value of this perpetuity is
(1) ₹ 6520
(2) ₹ 6250
(3) ₹ 5620
(4) ₹ 2650
44. Feasible region in the set of points which satisfy
(1) The objective functions
(2) Some the given constraints
(3) All of the given constraints
(4) None of these
45. $Z=20 x_{1}+20 x_{2}$, subject to $x_{1} \geq 0, x_{2} \geq 0, x_{1}+2 x_{2} \geq 8$, $3 x_{1}+2 x_{2} \geq 15,5 x_{1}+2 x_{2} \geq 20$. The minimum value of $Z$ occurs at
(1) $(8,0)$
(2) $\left(\frac{5}{2}, \frac{15}{4}\right)$
(3) $\left(\frac{7}{2}, \frac{9}{4}\right)$
(4) $(0,10)$

Read the following text and answer the following questions on the basis of the same :
Rohan has completed his MBA and now he wants to start a new business. So, he approaches to many banks. One bank is agreed to give loan to Rohan. So, Rohan has borrowed ₹ 5 lakhs from a bank on the interest rate of 12 per cent for 10 years.
46. EMI stands for:
(1) Equated Monthly Installments
(2) Emerging Monthly Installments
(3) Easy Monthly Installments
(4) None of the above
47. To calculate monthly installment, we use the following formula :
(1) Installment Amount $=\frac{(1+i)^{n}}{(1+i)^{n}} \times(P \times i)$
(2) Installment Amount $=\frac{(1+i)^{n}}{(1+i)^{n}-1} \times(P \times i)$
(3) Installment Amount $=\frac{(1+i)^{n}}{(1+i)^{n-1}} \times(P \times i)$
(4) None of these
48. Calculate monthly installment using (1.01) ${ }^{120}$ $=3.300$
(1) ₹ 7100
(2) ₹ 7174
(3) ₹ 7147
(4) ₹ 7200
49. Find the amount of total payment made by Rohan.
(1) ₹ $8,60,88$
(2) $₹ 8,80,880$
(3) ₹ $8,60,000$
(4) ₹ $8,60,880$
50. Find the amount of interest paid by Rohan.
(1) ₹ $3,60,88$
(2) ₹ $3,60,880$
(3) ₹ $3,60,00$
(4) ₹ $3,600,88$

