(1) Let $R=\{(3,3)(6,6)((9,9)(12,12),(6,12)(3,9)(3,12),(3,6)\}$ be a relation on the set $A=\{3,6,9,12\}$. The relation is
(a) reflexive and transitive
(b) reflexive only
(c) an equivalence relation
(d) reflexive and symmetric only
(2) Let $f:(-1,1) \rightarrow B$ be a function defined by $f(x)=\tan ^{-1}, t$ en $f$ is both one-one and onto when $B$ is the interval
( a ) $\left(0, \frac{\pi}{2}\right)$
(b) $\left[0, \frac{\pi}{2}\right]$
( c ) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
[AIEEE 2005]
(3) If a real valued function $f(x)$ satisfies th fy tional equation $f(x-y)=f(x) f(y)-f(a-x) f(a+y)$, Whefe' $a$ ' is a given constant and $f(0)=1$, then $f(2 a-x)$ is equal to
(a) $-\mathrm{f}(\mathrm{x})$
(b) $f(x)$
(c) $+(a-x)$
(d) $f(-x)$
[AIEEE 2005]
(4) Let $R=\{(1,3),(4,2)(2,(), 3),(3,1)\}$ be a relation on the set $A=\{1,2,3,4\}$. The relation $R$ is (a) a function
(c) not symmetric (d) reflexive
[ AIEEE 2004 ]
(5) The rars the function $f(x)={ }^{7-x} P_{x-3}$ is
$\{1,3\}$
(b) $\{1,2,3,4,5,6\}$
$1,2,3,4\}$
(d) $\{1,2,3,4,5\}$
[ AIEEE 2004]
$f: R \rightarrow S$, defined by $f(x)=\sin x-\sqrt{3} \cos x+1$ is onto, then the interval of $S$ is
(a) $[0,3]$
(b) [-1, 1]
(c) $[0,1]$
(d) $[-1,3]$
[ AIEEE 2004]
(7) The graph of the function $f(x)$ is symmetrical about the line $x=2$, then
(a) $f(x+2)=f(x-2)$
(b) $f(2+x)=f(2-x)$
(c) $f(x)=f(-x)$
(d) $f(x)=-f(-x)$
[ AIEEE 2004]
(8) The domain of the function $f(x)=\frac{\sin ^{-1}(x-3)}{\sqrt{9-x^{2}}}$ is
(a) $[2,3]$
(b) $[2,3$ )
(c) [1, 2]
(d) [1, 2 )
(9) If $f:\{1,2,3, \ldots.\} \rightarrow\{0, \pm 1, \pm 2, \ldots \ldots\}$ is defined by $f(x)= \begin{cases}\frac{x}{2}, & \text { if } x \text { is even } \\ -\frac{(x-1)}{2}, & \text { if } x \text { is odd }\end{cases}$
(a) 100
(b) 199
(c) 200
(d)
[ AIEEE 2003]
(10) Domain of definition of the function

(a) (1, 2 )
(b)
(d) $C$
0)
$(1,2)$
(c) $(1,2) \cup(2, \infty)$
(d)

(a) even funct
(c) periodic fl action
b) odd function
(d) none of these
[ AIEEE 2003]
(12) The funtrin $f: R \rightarrow R$ defined by $f(x)=\sin x$ is
into
(b) onto
(c) one-one
(d) many-one
[ AIEEE 2002]

The range of the function $f(x)=\frac{2+x}{2-x}, x \neq 2$ is
(a) $R$
(b) $R-\{-1\}$
(c) $R-\{1\}$
(d) $R-\{2\}$
[ AIEEE 2002]
(14) If $f(x)=\left\{\begin{array}{ll}x, & x \in Q \\ 0, & x \notin Q\end{array}\right.$ and $g(x)=\left\{\begin{array}{ll}0, & x \in Q \\ x, & x \notin Q\end{array}\right.$ then $(f-g)$ is
( a ) one-one, onto
(b) neither one-one nor onto
(c) one-one but not onto
(d) onto but not one-one
[ IIT 2005]
(15) If $f(x)=\sin x+\cos x$ and $g(x)=x^{2}-1$, then $g[f(x)]$ will be invertible for the domain
(a) $[0, \pi]$
(b) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$
( c ) $\left[0, \frac{\pi}{2}\right]$
(d) $\left[-\frac{\pi}{2}, 0\right.$
2004 ]
(16) The range of the function $f(x)=\frac{x^{2}+x+2}{x^{2}+x+1}, x \in(-\infty, \infty)$ is
(a) $[1, \infty)$
(b) $\left(1, \frac{11}{7}\right)$
( c ) $\left(1, \frac{7}{3}\right]$
(d)
$[1,4,3$
[ IIT 2003]
(17) f:[0, $\infty$ ) $\rightarrow[0, \infty)$,
$f(x)=\frac{x}{1+x}$ is
(a) one-one and onto
(b) one-one numa
(c) onto but not one-one
(d) neither ne o nor onto
[ IIT 2003]
(18) If $f(x)=(x+1)^{2}$ for $x \geq$ of the graph of $f(x)$ with reci the line $y=x$, then $g(x)$ equals

[ IIT 2002]
(19) If function $f: R-P$ is defined as $f(x)=2 x+\sin x$ for $x \in R$, then $f$ is
(a) or an anto
(b) one-one but not onto
(c) on $\rightarrow$ not one-one
(d) neither one-one nor onto
[ IIT 2002]
( $g(x)=1+x-[x]$ and $f(x)=\left\{\begin{aligned}-1, & x<0 \\ 0, & x=0, \\ 1, & x>0\end{aligned}\right.$ then for all $x, f[g(x)]=$
(a) $x$
(b) 1
(c) $f(x)$
(d) $g(x)$
[ IIT 2001]
(21) If $f:[1, \infty) \rightarrow[2, \infty)$ is given by $f(x)=x+\frac{1}{x}$, then $f^{-1}(x)$ equals
(a) $\frac{x+\sqrt{x^{2}-4}}{2}$
(b) $\frac{x}{1+x^{2}}$
(c) $\frac{x-\sqrt{x^{2}-4}}{2}$
(d) $1+\sqrt{x^{2}-4}$
[ IIT 2001]
(22) The domain of definition of $f(x)=\frac{\log _{2}(x+3)}{x^{2}+3 x+2}$ is
(a) $R-\{-1,-2\}$
(b) $(-2, \infty)$
(c) $R-\{-1,-2,-3\}$
(d) $(-3, \infty)-\{-1,-2\}$

2001 ]
(23) If $E=\{1,2,3,4\}$ and $F=\{1,2\}$, then the number of onto fund fons $\mathrm{O} E$ to $F$ is
(a) 14
(b) 16
(c) 12
(d) 8
[ IIT 2001]
(24) If $f(x)=\frac{\alpha x}{x+1}, x \neq-1$, then for which value of $[f(x)]=x$ ?
(a) $\sqrt{2}$
(b) $-\sqrt{2}$
(c) 1
[ IIT 2001]
(25) Let $f: R \rightarrow R$ be any function. Define $R(B$ by $g(x)=|f(x)|$ for all $x$. Then $g$ is
(a) onto if $f$ is onto
(c) continuous if $f$ is continuo

## (b) on-one if $f$ is one-one

d) Nifferentiable if $f$ is differentiable
[ IIT 2000]
(26) The domain of definition of the function $y(x)$ as given by the equation $2^{x}+2^{y}=2$ is
(a) $0<x \leq 1$
(c) $-\infty<\mathrm{x} \leq 0$
(d) $-\infty<x<1$
[ IIT 2000]
(27) If the function $f(1, \infty) \rightarrow[1, \infty)$ is defined by $f(x)=2^{x(x-1)}$, then $f^{-1}(x)$ is
(b) $\frac{1}{2}\left(1+\sqrt{1+4 \log _{2} x}\right)$
$\left(1+\sqrt{1-4 \log _{2} x}\right)$
(d) not defined
[ IIT 1999]
${ }^{28}$ In a college of 300 students, every student reads 5 newspapers and every newspaper is read by 60 students. The number of newspapers is
(a) at least 30
(b) at most 20
(c) exactly 25
(d) none of these
[ IIT 1998]
(29) If $f(x)=\frac{x^{2}-1}{x^{2}+1}$, for every real number $x$, then the minimum value of $f$
(a) does not exist as $f$ is unbounded
(b) is equal to 1
(c) is not attained even though $f$ is bounded
(d) is equal to -1
[ IIT 1998]
(30) If $f(x)=3 x-5$, then $f^{-1}(x)$
(a) is given by $\frac{1}{3 x-5} \quad$ (b) is given by $\frac{x+5}{3}$
(c) does not exist because $f$ is not one-one
(d) does not exist because $f$ is not onto
(31) If $g[f(x)]=|\sin x|$ and $f[g(x)]=(\sin \sqrt{x})^{2}$, then
(a) $f(x)=\sin ^{2} x, g(x)=\sqrt{x}$
(b) $f(x)=\sin y=g(x)=|x|$
(c) $f(x)=x^{2}, g(x)=\sin \sqrt{x}$
(d) fand g co on y determined
[ IIT 1998]
(32) If $f(x)=(x+1)^{2}-1,(x \geq-1)$, then $\mathcal{S}=\left\{x: f(x)=f^{-1}(x)\right\}$ is
( a ) $\left\{0,-1, \frac{-3+i \sqrt{3}}{2}, \frac{-3-i \sqrt{3}}{2}\right\}$
(b) $\{0,1,-1\}$
(c) $\{0,-1\}$
(d) empty
[ IIT 1995]
(33) The number $\log _{2} 7$ is
(a) an integer
(c) an irration
(b) a rational number
(d) a prime number
[ IIT 1990]
(34) If sis het of all real $x$ such that $\frac{2 x-1}{2 x^{3}+3 x^{2}+x}$ is positive, then $S$ contains
$\cdots\left(-\infty,-\frac{3}{2}\right)$
(b) $\left(-\frac{3}{2},-\frac{1}{4}\right)$
(c) $\left(-\frac{1}{4},-\frac{1}{2}\right)$
(d) $\left(\frac{1}{2}, 3\right)$
(e) none of these
[ IIT 1986]
(35) If $y=f(x)=\frac{x+2}{x-1}$, then
(a) $x=f(y) \quad$ (b) $f(1)=3 \quad$ (c) $y$ increases with $x$ for $x<1$
(d) $f$ is a rational function of $x$
[ IIT 1984]
(36) Let $f(x)=|x-1|$. Then
(a) $f\left(x^{2}\right)=[f(x)]^{2}$
(b) $f(x+y)=f(x)+f(y)$
(c) $f(|x|)=|f(x)|$
(d) None of these
(37) The domain of definition of the function $y=\frac{1}{\log _{10}(1-x)}$
(a) (-3, - 2 ) excluding - 2.5
(b) [0, 1] excluding 0.5
(c) $[-2,1]$ excluding 0
(d) None of these
[ IIT 1983]
(38) Which of the following functions is periodic?
(a) $f(x)=x-[x]$ where $[x]$ denotes he real integer less than or equal to the real number $x$
(b) $f(x)=\sin \frac{1}{x}$ for $x \neq 0$,
(c) $f(x)=x \cos x \quad$ (d)


[ IIT 1983]
(39) If $X$ and $Y$ are two sets, (en $X \cap(X \cup Y)^{c}$ equals
(a) $X$
(b)
(d) none of these

[ IIT 1979]
(40) Let $R$ be the set of real numbers. If $f: R \rightarrow R$ is a function defined by $f(x)=x^{2}$, then $f$
(a) inju ye but not subjective
(b) subjective but not injective
(d) none of these
[ IIT 1979]

## Answers

| $\mathbf{1}$ | $\mathbf{2}$ | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| a | d | a | c | a | d | b | b | d | b | a | d | b | a | b | c | b | d | a | b |


| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| a | d | a | d | c | d | b | c | d | b | a | c | c | a,d | a,d | d | c | a |  |  |

