21 — 2

$3^{51} \bmod 5 = \left((3^4)^{12} \times 3^3\right) \bmod 5$

$= 3^{48}\ 3^3 \bmod 5$

$= 2$ Ans

22 — 0.502

Two no. chosen independently & uniformly at random from the set $\{1, 2, \ldots 13\}$ probability → 4 bit binary representation have same most significant bit

Sol^n ~~0.502~~

$P(\text{MSB is } 0) + P(\text{MSB is } 1)$

$= (7\times7)/(13\times13) + (6\times6)/(13\times13)$

$= \frac{85}{169}$

$= 0.502$ Ans

23 — 80

P_1	P_2	P_3
$D = D+20$	$D = D-50$	$D = D+10$

min & max value of D after 3 process have completed execution are X & Y, $Y - X = ?$

Sol^n

$D = 100$	$D = 100$
~~$D = 100+20 = 120$~~	~~$D = 100-50 = 50$~~
$D = 120+1 = 130$	$D = 100+20 = 120$
$D = 100 - 50 = 50$	$D = 120+10 = 130$

$130 - 50 = 80$ Ans

(24) ⇒ #include<stdio.h>

(B)

```
int main() {
        int arr[] = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3 }, *ip = arr+4;
        printf("%d", ip[1]);
        return 0;
}
```

Output = 6 Ans

(25) ⇒ $A = [-5, -10, 6, 3, -1, -2, 13, 4, -9, -1, 4, 12, -3, 0]$

(29)

$sum(i, j) = \sum_{k=i}^{j} A[k]$ $0 < i < j < 14$

Sol^n

$\max S(i, j)$

$= S(2, 11) = 6 + 3 + (-1) + (-2) + 13 + 4 + (-9) + (-1) + 4 + 12$

$= 29$ Ans

(26) ⇒

(D)

```
void convert (int n)
{ if (n < 0)
        printf("%d", n);
   else {
        convert (n/2);
        printf("%d", n%2);
   }
}
```

→ not print any & not terminate

27 8

B

```
#include <stdio.h>
int r() {
      static int num = 7;
        return num--;
   }
int main()
  { for ( r(); r(); r())
          printf("%d " r());
     return 0;
  }
```

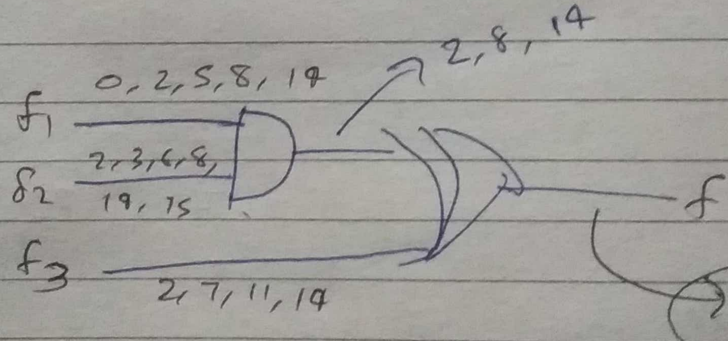
Output - 52

28

29

30

A



7, 8, 4

$\Sigma(7, 8, 11)$ Ans

31

$\Sigma = \{a, b\}$, not context free?

C

$\{w a^n w^R b^n \mid w \in \{a, b\}^*, n \geq 0\}$

(32) $F = \{QR \rightarrow S, R \rightarrow P, S \rightarrow Q\}$

(C) $X = \{PQRS\}$, X is not in BCNF.

$Y = (PR)$, $Z = (QRS)$

(I) Both Y, & Z are in BCNF

(II) Decomposition of X into Y & Z is dependency preserving & lossless.

True

$Y(PR)$	$Z(QRS)$
$R \rightarrow P$	$QR \rightarrow S$, $S \rightarrow Q$

Only II true