SECTION - I

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C), (D), out of which ONLY ONE is correct. Choose the correct option.

1. A number n leave the same remainder while dividing 5814, 5430, 5958. What is the largest possible value of n?

   (a) 96 (b) 12 (c) 48 (d) 192

2. Given that $x_1, x_2, x_3, \ldots\ldots\ldots\ldots x_{15}, x_{16}$ are positive real number such that $\frac{x_1}{x_2} = \frac{x_2}{x_3} = \frac{x_3}{x_4} \ldots\ldots\ldots\ldots = \frac{x_{15}}{x_{16}}$ if $x_1 + x_2 + x_3 + x_4 = 20, x_5 + x_6 + x_7 + x_8 = 320$ and $x_{13}3 + x_{14} + x_{15} + x_{16}$ is

   (a) 20480 (b) 19680 (c) 40960 (d) 81920

3. What is the last digit in the finite decimals presentation of the number $\frac{1}{5^{2003}}$?

   (a) 2 (b) 4 (c) 6 (d) 8

4. If $S_n = 1-2+3-4+5-6+7-8+\ldots.$ (upto n terms) then $S_{2002} - S_{2003} + S_{2004}$ is

   (a) 3005 (b) -1001 (c) -3005 (d) 1001

5. The remainder on dividing $121^n - 25^n + 1900^n - (-4)^n$ by 2000 is

   (a) 1000 (b) 1 (c) 0 (d) 8

6. The highest power of 2003 that divides 2003 is

   (a) 10 (b) 9 (c) 101 (d) 1001

7. What is the smallest positive integer n such that $\sqrt{n} - \sqrt{n-1} < 0.01$?

   (a) 2499 (b) 2500 (c) 2501 (d) 10000

8. The largest integer n for which $n^{200} < 5^{300}$ is

   (a) 8 (b) 9 (c) 10 (d) 11

9. The unit digit of $3^{1001} \times 7^{1002} \times 13^{1003}$ is

(a) 1 (b) 3 (c) 5 (d) 7

10. The smallest positive integer x for which $1260x = N^3$ where N is an integer is

(a) 1050 (b) 1260 (c) 1260^2 (d) 7350

11. When 2^{1000} is divided by 13, the remainder is

(a) 1 (b) 2 (c) 3 (d) 7

12. The sum of all the integers between 50 and 350 which in 1 is

(a) 5684 (b) 5539 (c) 5208 (d) 4877

13. The number of solutions in positive integers of 2x + 3y = 763 is

(a) 225 (b) 254 (c) 128 (d) 127

14. When 1000 single digit non-zero numbers are the unit place is 5. The maximum carry over in this case is

(a) 495 (b) 895 (c) 899 (d) 995

15. If $!_5 = 4+6-5, !_{12} = 11+13-12$ and $!_{23} = 22+24-23$ then what is the value $!40+!41+!42+.....+!50$?

(a) 505 (b) 495 (c) 455 (d) 465

16. $(a-1)^2 + (b-2)^2 + (c-3)^2 + (d-4)^2 = 0$ then $a \times b \times c \times d + 1$ is

(a) 0^2 (b) 10^2

(c) 5^2 (d) $1^2 + 2^2 + 3^2 + 4^2 + 1$

17. The length term of sequence (2, 5) (3, 7) (5, 11) (7, 13) (11, 17) is

(a) (23, 29) (b) (19, 13) (c) (20, 04) (d) (29, 37)

18. The sum of the digits of the number $10^n - 1$ is 3798. The value of n is

(a) 431 (b) 673 (c) 422 (d) 501

19. Three people each think of a number, which is the product of two different primes. The product of the three numbers which are thought of is

(a) 120 (b) 12100 (c) 240 (d) 3000

20. The largest positive integer which cannot be written in the form 5m + 7n when m and n are positive integer is

(a) 25 (b) 35

(c) grater than 100 (d) greater than 350

21. Let n be the least positive integer such that 1260n is the cube of a natural number.

(a) $1 < n < 50$ (b) $50 < n < 100$

(c) $100 < n < 1000$ (d) $1000 < n < 10000$

22. For how many integers n is $\sqrt{9-(n+2)^2}$ a real number?

(a) 3 (b) 5 (c) 7 (d) infinitely many

23. How many solutions are there for (a, b) if 7ab73 is a five digit number divisible by 99?

(a) 3 (b) 2 (c) 0 (d) 1

24. The number $107^{90} - 76^{90}$ is divisible by

(a) 61 (b) 62 (c) 64 (d) none of these

25. When $1^{2003} + 3^{3003} + ... + 2003^{2003}$ is divided by 2004, then the remainder is

(a) 0 (b) 1 (c) 1002 (d) 2003

26. Each number from 1, 2, 3,……. 100 (decimal scale) is written in base 6 and their product is also written in base 6. Then the number of zeros at the end of this product is

(a) 24 (b) 48 (c) 18 (d) 97

27. The three last digits of 7^{9999} are

(a) 263 (b) 143 (c) 343 (d) 523

28. The natural number 1, 2, 3,…….. upto 100 are written in that natural order to form the single number 1234 …….. 979899100 the number of times the digit 1 occurs in this number is

(a) 11 (b) 12 (c) 20 (d) 21

29. If $n! = 1 \times 2 \times 3 \times ..... \times n$ has four zeros at the end and $(n+1)! = n! \times (n+1)$ has six at the end, then the value of n is

(a) 20 (b) 24 (c) 25 (d) 2

30. Given $2x^2 + 3y^2 = 35$, then the number of ordered pairs (x, y) where (x, y) are integers satisfying the above equation is

(a) 2 (b) 4 (c) 8 (d) 16

SECTION - II

Assertion - Reason Questions

This section contains certain number of questions. Each question contains STATEMENT-1 (Assertion) and STATEMENT - 2 (Reason). Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct. Choose the correct option.

31. STATEMENT-1: $17^8 + 13^7 - 5^8 + 2^7$ is divisible by 3

because

STATEMENT - 2: If sum of the digit of a number is divisible by 3 then the number is divisible by 3.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

32. STATEMENT-1: If the number A3640548981270644B is divisible by 99 then A -= 9, B = 1

because

STATEMENT - 2: A six digit number of the form ABC. ABC is always divisible by 7 or 13.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

33. STATEMENT-1: $2222^{5555} + 5555^{2222}$ is divisible by 7

because

STATEMENT - 2: $x^n + y^n$ is divisible by x + y if n is odd positive integer.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

34. STATEMENT-1: $5^{10} - 3^{10}$ is divisible by 11

because

STATEMENT - 2: If P is a prime number G.C.D. of (a, p) = 1 then $a^{p-1} \equiv 1$ (mod p).

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

35. STATEMENT-1: The number of +ve integers ** 3600 that co-prime to 3600 is 960

because

STATEMENT - 2: The number of integers $\leq$ n and co-prime to n is called Eula's function for n and denoted by (n)

$$(n)\left[1-\frac{1}{P_1}\right]\left[1-\frac{1}{P_2}\right].....\left[1-\frac{1}{P_r}\right]$$

Where $P_1, P_2, ...P_r$ distinct prime numbers.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

36. STATEMENT-1: The product of $n\left(n^2-1\right)$ is multiple of 6

because

STATEMENT - 2: Product n consecutive integers is divisible by n!.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

37. STATEMENT-1: The number of divisible of 9504 is 48

because

STATEMENT - 2: If number $N = p^a \times q^b \times r^c$.

Where p, q, r are primes then the number of factors of N are (a + 1) (b + 1) (c + 1) including 1 and itself.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

38. STATEMENT-1: The sum of divisors of 2160 is 7440

because

STATEMENT - 2: The smallest integers with exactly divisors is 360.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

39. STATEMENT-1: The highest power of 7 contains in 1000 ! is 164

because

STATEMENT - 2: The highest power of 3 contains in 1000 ! is 498

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

40. STATEMENT-1: The number of zeros at the end of 400 ! is 99

because

STATEMENT - 2: The number of factor at the end of n ! is $= \sum_{k=1}^{\alpha}\left[\frac{n!}{5^k}\right]$

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

SECTION - III
Linked Comprehension Type

This section contains paragraphs. Based upon each paragraph multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. Choose the correct option.

Paragraph for Question Nos. 41 to 43

If a and b are two integers and n is a positive integer, then a is said to be congruent to b modulo m is m |a – b in notation form we express it as $a \equiv b$ (mod m) or $a - b \equiv 0 \pmod{m}$.

41. The remainder in the division of 20_2 by 7

(a) 4 (b) 2 (c) 0 (d) 3

42. The remainder in the division of 40_5 by 23

(a) 4 (b) 2 (c) 0 (d) 3

43. The remainder when 57_2 is divided by 8

(a) 4 (b) 2 (c) 0 (d) 3

Paragraph for Question Nos. 44 to 46

Let $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$ then

$a + c \equiv b + d \pmod{m}$

$a - c \equiv b - d \pmod{m}$

$ac \equiv bd \pmod{m}$

$pa + qc \equiv pb + qd \pmod{m}$

$an \equiv bn(\mathrm{mod}\, m)$ for every positive integer n.

44. The last two digits of $25^{63} \times 63^{25}$ are

(a) 75 (b) 37 (c) 89 (d) 98

45. The last three digits of $25^{63} \times 63^{25}$ are

(a) 275 (b) 375 (c) 475 (d) 575

46. The last two digits of $(56789)^{41}$ are

(a) 75 (b) 37 (c) 89 (d) 98

Paragraph for Question Nos. 47 to 49

If P is a prime number G.C.D. of (a, b) = 1

Then $a^{P-1} \equiv (\mathrm{mod}\, p)$

If P is prime then $(a+b)^P \equiv (a^P + b^P)(\mathrm{mod}\, p)$

If P is prime then $(P-1)! + 1 \equiv O(\mathrm{mod}\, p)$

47. The remainder when the number $10^{10} + 10^{10^2} + \ldots\ldots\ldots + 10^{(10^{10})}$ is divided by 7 is

(a) 4 (b) 5 (c) 6 (d) 7

48. The remainder when $13^{73} + 14^3$ is divided by 11 is

(a) 2 (b) 4 (c) 5 (d) 6

49. The remainder 2000^{1000} is divided by 13 is

(a) 2 (b) 4 (c) 3 (d) 7

Paragraph for Question Nos. 50 to 52

The expression $a^n - b^n$ is always divisible by a – b if n is any positive integer.

The expression $a^n - b^n$ is divisible by a + b if n is any even positive integer.

The expression $a^n + b^n$ is exactly divisible by a + b if n is odd, but not if n be even.

50. $4^{4n} - 5^{3n}$ is divisible by

(a) 131 (b) 15 (c) 8 (d) 16

51. $2^{4n} - 1$ is divisible by

(a) 131 (b) 15 (c) 8 (d) 16

52. $3^{2n} + 7$ is divisible by

(a) 131 (b) 15 (c) 8 (d) 16

Paragraph for Question Nos. 53 to 55

If is any real number, then the largest integer, which does not exceed x is called the integer part of x, the integer [x] is after called the bracket function/step sunction.

53. For a real number x, [x] denotes the integer part of x the value of

$$\left[\frac{1}{2}\right]+\left[\frac{1}{2}+\frac{1}{100}\right]+\left[\frac{1}{2}+\frac{2}{100}\right]+.....+\left[\frac{1}{2}+\frac{99}{100}\right] \text{ is}$$

(a) 50 (b) 47 (c) 45 (d) 52

54. The number of zeros at the end of 400 !

(a) 67 (b) 99 (c) 78 (d) 85

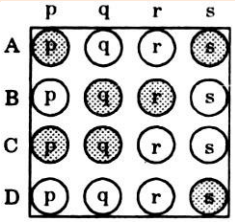
55. If 'n' is any positive integer then $\left[\frac{n+1}{2}\right]+\left[\frac{n+2}{4}\right]+\left[\frac{n+4}{8}\right]+.....$ is

(a) n (b) $\frac{n}{2}$ (c) $\frac{n}{4}$ (d) $\frac{n}{8}$

SECTION - IV
Matrix - Match Type

This section contains Matrix-Match type questions. Each question contains statements given in two columns which have to be matched. Statements (a, b, c, d) in Column I have to be matched with statements (p, q, r, s) in Column II. The answers to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are a-p, a-s, b-q, b-r, c-p, c-q and d-s, then the correctly bubbled 4 x 4 matrix should be as follows:



56.

Column I	**Column II**
(a) $\frac{1}{2}-\frac{2}{4}+\frac{3}{8}-\frac{4}{16}+\frac{5}{32}+.....+\frac{n}{2^n}(-1)^{n+1}+.....$	(p) $\frac{2}{9}$
(b) $1+\frac{1}{2}(1+2)+\frac{1}{3}(1+2+3)+....+\frac{1}{16}(1+2+3+.....+16)$	(q) 76
(c) $2.2^2+3.2^3+4.2^4+.....513.2^{513}$	(r) 2^{613}
(d) $\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right).....\left(1-\frac{1}{2007^2}\right)$	(s) $\frac{2007}{4014}$

57.

Column I	**Column II**
(a) G.C.D. of $2^{100}-1, 2^{120}-1$	(p) $2^{20}-1$
(b) G.C.D. of (2n + 13, n + 7)	(q) 1

(c) If $\frac{37}{13} = 2 + \frac{1}{x + \frac{1}{y + \frac{1}{z}}}$ (r) (1, 5, 2)

(d) $2^{11} + 2^8 + 2^n$ is a perfect square then the value of n (s) 12

58.

Column I	Column II
(a) $n^2 + n + 41$ is a perfect square	(p) n = - 41 or 40
(b) $2^{200} - 2^{192}.31 + 2^n$ is perfect square	(q) n = 198
(c) $S_n = 1 - 2 + 3 - 4 + 5 - 6 + 7....$ (up to n terms) then $S_{2002} - S_{2003}$	(r) 3005
(d) If $3^{\frac{a}{b}}, 3^{\frac{b}{a}} = 3^{\frac{5}{2}}$ the $\left\|9^{\frac{a}{b}} - \frac{b}{a}\right\|$ is	(s) 27

59.

Column I	Column II
(a) Unit digit of 777^{777}	(p) 7
(b) Unit digit of 23^{562}	(q) 9
(c) Unit of 2^{2^n}, n > 2	(r) 6
(d) Unit digit of $333^{333} + 777^{777}$	(s) 0

60.

Column I	Column II
(a) 3124a6 is divisible by 6 then a is	(p) 2, 5, 8
(b) 71a is divisible by 4 then a is	(q) 2, 6
(c) 3A55B is divisible by 792 then A is	(r) 2
(d) A356 is divisible by 99 then A is	(s) 4