TIME ALLOWED – 3 hrs

General Instructions-

(a) All questions are compulsory.

(b)This Question paper consists of 38 questions divided into five sections A, B, C, D and E.

(c)Section A comprises of 20 questions of one mark each (Q 1-20)

Section B comprises of 05 questions of two marks each (Q 21-25)

Section C comprises of 06 questions of one mark each (Q 26-31)

Section D comprises of 05 questions of one mark each (Q 32-35)

Section E comprises of 03 Case -study questions of four mark each (Q 36-38)

(d)There is no overall choice. However, internal choice has been provided in all the Sections You must attempt only one of the alternatives in such questions.

SECTION A

1. Which of the following complex numbers is equal to $Z = i^{1+2+3+\cdots+25}$

    (a)$1+i$ (b)$-1 +0i$ (c)$1-i$ (d)$0+i$

2. If $\tan(A+B) = m, \tan(A-B) = n$, then $\tan 2B$ is

    (a)$\frac{m}{1+mn}$ (b)$\frac{n}{1+mn}$ (c)$\frac{m+n}{1+mn}$ (d)$\frac{m-n}{1+mn}$

3. If $\frac{4}{x+2} < 0$, then x belongs to

    (a)$(-\infty,-2)$ (b)$(-2,\infty)$ (c)$(-\infty,-2) \cup (-2,\infty)$ (d)none of these

4. The minimum value of $4^x + 4^{1-x}, x \in R$ is

    (a) 2 (b)4 (c) 1 (d)0

5. Solution of the equation $|x-1|>1, x \in R^+$ is

    (a)$[2,\infty)$ (b)$(2,\infty)$ (c)$(0,\infty)$ (d)$(-\infty,0)$

6. A wheel makes 270 revolutions in one minute. The radian it turns in one second is -

    (a) 6π (b)12π (c) 8π (d)9π

7. If $A = \{x : x \in R, -1 \le x < 1\}$, $B = \{x : x \in R, 0 \le x \le 4\}$, then $A \cap B =$

    (a) $[0,1)$ (b)$(0,1)$ (c)$(-1,4]$ (d)$[-1,4]$

8. The third term of a G.P is 5. The product of first five terms is

    (a)5^3 (b) 5^4 (c) 5^5 (d))5^6

9. If $f(x) = ax +b$, where a and b are integers, $f(-1)= -5$ and $f(3)= 3$, then a and b are

    (a) $a=-3, b=-1$ (b) $a=2, b=-3$ (c) $a=0, b=2$ (d) $a=2, b=3$

10. In a chess tournament, each of the six players will play with every other player exactly once. The number of matches that will be played in the tournament are

    (a) 10 (b) 15 (c) 20 (d)25

11. If the second term of a G.P is 2 and the sum of its infinite terms is 8, then the first term is

    (a) ¼ (b)1/2 (c) 2 (d) 4

12. $\lim\limits_{x \to \pi} \frac{\sin 5x}{x-\pi}$ is equal to

    (a)1 (b)5 (c)-5 (d)- 1

13. The standard deviation of first seven natural numbers is

    (a) 2 (b) 3 (c) 4 (d) 10

I

14. $\lim\limits_{x \to -1/2} \dfrac{8x^3 - 1}{16x^4 - 1}$ is

  (a) -1/2   (b) 1/4   (c)3/4   (d) 1/2

15. The distance between lines 2x-y+5 = 0 and 4x-2y+1 = 0 is

  (a) $\dfrac{9\sqrt{5}}{10}$ (b)$\dfrac{9}{\sqrt{5}}$ (c)$\dfrac{3}{\sqrt{5}}$ (d)$\sqrt{5}$

16. If focus of parabola is (4,0) and vertex at origin, then its equation is

  (a)$y^2 = 16x$ (b)$y^2 = -16x$ (c)$x^2 = 16y$ (d) $x^2 = -16y$

17. The equation of hyperbola whose vertices lie at $(0, \pm 3)$ and foci at $(0, \pm 5)$ is

  (a) $\dfrac{x^2}{39} - \dfrac{y^2}{25} = -1$ (b) $\dfrac{y^2}{16} - \dfrac{x^2}{9} = 1$ (c) $\dfrac{x^2}{16} - \dfrac{y^2}{9} = -1$ (d)none of these

18. The value of $\cos 40° + \cos 80° + \cos 240° + \cos 160°$ is

  (a) 1/2   (b) -1/2   (c)1   (d)0

Following are ASSERTION -REASON based questions (Q 19- Q20)
Read the following statements carefully to mark the correct option out of the options given below
(a) Assertion (A) is true, Reason(R) is true, and R is correct explanation of A
(b) Assertion (A) is true, Reason(R) is true, and R is NOT the correct explanation of A
(c)Assertion (A) is true, Reason (R) is false
(d) Assertion (A) is false, Reason (R) is true

19. Assertion: Total outcomes of drawing 2 balls from a bag containing 5 red and 4 black balls is 18.
   Reason: To find the total outcomes in case of drawing more than one article, we use C(n,r)

20. Assertion: Fifth term in the expansion of $(x + \frac{1}{x})^{10}$ is $C(10,5)$
   Reason: Coefficient of second term in the expansion of $(x + y)^n$ is C(n,1)

SECTION B

21. Let $U = \{x \in N : x \le 8\}$, $A = \{x \in N : 5 < x^2 < 50\}$ and
$B = \{x \in N : x \text{ is prime number less than } 10\}$, Find (i) $A \cap B'$ (ii) B -A

22. Find the equation of line which passes through the point (6,7) and cuts off intercepts on the axes which are equal in magnitude but opposite in sign.

OR

Find the point(s) on the X – axis whose distance from the line $\frac{x}{3} + \frac{y}{4} = 1$ are 4 units.

23. Find conjugate of $\dfrac{2-i}{(1-2i)^2}$

OR

If x+iy $= \sqrt{\dfrac{1+i}{1-i}}$, then find the value of $x^2 + y^2$

24. Find equation of circle having centre at (3,-4) and touching line 5x+12y -12=0

25. Show that the points A (1, -2,-8),B(5,0,-2) and C (11,3,7) are collinear. Also, find the ratio in which B divides AC.

SECTION C

26. Two unbiased dice are thrown. Find the probability that neither a doublet nor a total of 10 will appear.

OR

A 5-digit number is formed by the digits 1,2,3,4,5 without repetition. Find the probability that the number formed is divisible by 4.

27. If the coefficients of $(r-5)^{th}$ and $(2r-1)^{th}$ terms in the expansion of $(1+x)^{34}$ are equal, find the terms

OR

Using Binomial Theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.

28. Prove that $\dfrac{\sec 8\theta - 1}{\sec 4\theta - 1} = \dfrac{\tan 8\theta}{\tan 2\theta}$

OR

If $\tan A = k \tan B$, show that, $\sin(A+B) = \left(\dfrac{k+1}{k-1}\right) \sin(A-B)$

29. Solve the following for Real number 'x'
$$\dfrac{x-2}{x-3} \geq 2$$

30. Let $f(x) = \dfrac{x^2}{1+x^2}$, find the domain and range of $f(x)$

31. Evaluate $\lim\limits_{x \to 0} \dfrac{\tan 2x - \sin 2x}{x^3}$

SECTION D

32. The ratio of the AM and GM of two positive numbers a and b is m: n, find the ratio between a and b

OR

The product of three terms in GP is 1000. If 6 and 7 are added to second and third term respectively, the terms form an AP, find the GP.

33. Three married couples are to be seated in a row having six seats in a cinema hall. If spouses are to be seated next to each other, in how many ways can they be seated. Find also the number of ways of their seating if all ladies sit together.

34. Prove that $\cos^2\dfrac{\pi}{8} + \cos^2\dfrac{3\pi}{8} + \cos^2\dfrac{5\pi}{8} + \cos^2\dfrac{7\pi}{8} = 2$

OR

34.(i) Prove that $\tan 80° = \tan 10° + 2\tan 70°$ (2+3)

(ii) Prove that $\sqrt{2 + \sqrt{2 + 2\cos 4x}} = 2\cos x$, $0 < x < \dfrac{\pi}{4}$

35. Differentiate the following with respect to x   (2+3)
(i) $f(x) = \cosec^3(3x+5) + x^2 e^{2x}$

(ii) $f(x) = \dfrac{x\sin x + \cos x}{x\cos x + \sin x}$

SECTION E

36. Mirror is a smooth, polished surface usually glass with metallic coating, that reflects light to form clear image, acting like a "looking glass" for seeing reflections. The incident ray and reflected ray during the process of reflection, are defined as follows-
Incident ray— The ray of light falling on the coated surface AB (here X -axis)is called the incident ray. In figure **PN** is the incident ray.

3

Reflected ray— The incident ray bouncing back in the same medium after striking the reflecting surface is called reflected ray. In figure NQ is the reflected ray.
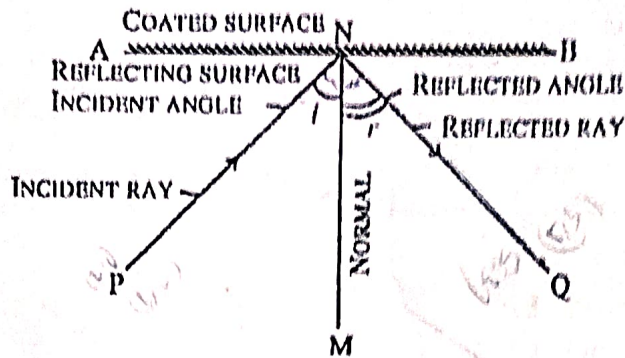
A ray of light passing through the point P (1,2) reflects on the x -axis at the point N and the reflected ray passes through the point Q (5,3),then   (2+1+1)
  (i) Find the coordinates of point N
  (ii) Find the equation of incident ray PN
  (iii) Find the equation of reflected ray NQ

<div align="center">OR</div>

  Find the distance between P and Q

37. Four friends Sheetal, Seema, Shalini and Preeti tossed three coins and report their result as following - A,B,C and D respectively
    Sheetal (A) = got exactly two heads   ;Seema(B)= got at least two head
    Shalini (C) = got at most two heads   ; Preeti(D) = got exactly three heads
  On the basis of above, answer the following-   (1+1+2)
  (i) Find the events which are mutually exclusive but not exhaustive
  (ii) Find the events which are exhaustive
  (iii) Find probability of event A

<div align="center">OR</div>

  (iii)Find events which are mutually exclusive as well as exhaustive

38. While calculating the mean and standard deviation of 10 readings, a student wrongly used the reading 52 instead of the correct reading 25. He obtained the mean and variance as 45 and 16 respectively.   (2+2)
  (i) Find the correct mean
  (ii) Find the correct variance

<div align="center">4</div>