

(a) $\frac{1}{11}$

(b) $\frac{2}{11}$

(c) $\frac{5}{11}$

(d) $\frac{6}{11}$

Q11. If $A = \{x : x \text{ is a letter of the word 'IMITATE'}\}$ and $B = \{y : y \text{ is a letter of the word "INTEGRATE"}\}$. Then $A \cap B$ is equal to :

(a) $\{I, A, T\}$

(b) $\{I, E, T\}$

(c) $\{I, A, T, E\}$

(d) $\{I, T\}$

Q12. For two sets A and B, if $n(A) = p$ and $n(B) = q$ then the total number of non-empty relations that can be defined from A to B is :

(a) p^q

(b) 2^{pq}

(c) $2^{p+q} - 1$

(d) $2^{pq} - 1$

Q13. A wheel makes 180 revolutions in one minute. The distance traveled by it in radians in one second is :

(a) 3π

(b) 6π

(c) 9π

(d) 2π

Q14. If x is a real number satisfying $-3x + 17 < -13$, then the range of x is :

(a) $(10, \infty)$

(b) $[10, \infty)$

(c) $(-\infty, 10]$

(d) $[-10, 10)$

Q15. If $f(x) = ax + b$, where a and b are integers, $f(-1) = -5$ and $f(3) = 3$, then a and b are equal to :

(a) $a = -3, b = -1$

(b) $a = 2, b = -3$

(c) $a = 0, b = 2$

(d) $a = 2, b = 3$

Q16. The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ is :

(a) 50

(b) 202

(c) 51

(d) none of these

Q17. $\lim_{x \rightarrow \pi} \frac{\sin x}{x - \pi}$ is :

(a) 1

(b) 2

(c) -1

(d) -2

Q18. Probability of selecting a three digit number having the same digits from the given 3 digit numbers whose all three digits are even is :

a) $\frac{1}{16}$

b) $\frac{16}{25}$

c) $\frac{1}{645}$

d) $\frac{1}{25}$

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(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 but R is true.

Q19. ASSERTION (A): $\lim_{x \rightarrow 0} \frac{(1+x)^n - 1}{x} = n, n \in \mathbb{N}$.

REASON (R): $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}, n \in \mathbb{N}$.

Q20. ASSERTION (A) : The value of $i^2 + i^4 + i^6 + \dots + i^{20}$ is 1.

REASON(R): $i^{4n} = 1, n \in \mathbb{Z}$.

SECTION B

Q21. Find the number of subsets of the set $A = \{K, I, T, E\}$. Also write them.

Or

For any three non empty sets, P, Q and R, if $Q \subset R$, then prove that $P - R \subset P - Q$.

Q22. Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{9+x} - 3}{x}$

Q23. Find whether the points A(0,4,1), B(2,3,-1) and C(4,5,0) are the vertices of a right triangle.

Q24. Which term of the progression 18, -12, 8, ... is $\frac{512}{729}$?

Or

Find the value of $2 \cdot 2^{\frac{2}{3}} \cdot 2^{\frac{4}{9}} \cdot 2^{\frac{8}{27}} \dots \infty$.

Q25. Prove $\sum_{r=0}^n 3^r \cdot C(n, r) = 4^n$

SECTION C

Q26. If $R = \{(x, y) : x, y \in Z \text{ and } x^2 + y^2 = 64\}$ is a relation, then express R in roster form. Also write the domain and range of R.

Or

Find the domain and range of the function: $f(x) = \frac{3}{2-x^2}$.

Q27. How many litres of water will have to be added to 1350 litres of the 35% solution of acid so that the resulting mixture will contain more than 15% but less than 30% acid content?

Q28. If $(1+i)(1+2i)(1+3i) \dots (1+ni) = a+ib$. Prove that $2 \cdot 5 \cdot 10 \dots (1+n^2) = a^2 + b^2$

Q29. If $(1 + \tan A)(1 + \tan B) = 2$, then find the value of $\tan(A+B)$. Hence find $(A + B)$.

Q30. Differentiate: $\frac{1 + \tan x}{1 - \tan x}$ w.r.t. X.

Or

Find the derivative of $f(x) = x \cos x$ by first principle.

Q31. A point moves so that the square of its distance from the point (3, -2) is numerically equal to its distance from the line $5x - 12y = 3$. Find the equation of its locus.

Or

Find the distance of the origin from the line joining the point (3, 5) to the point of the intersection of the line $4x + y = 1$ and $7x - 3y = 35$.

SECTION D

Q32. If $\tan x = -\frac{4}{3}$. x is in IV quadrant. Find the value of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$.

Or

Prove that : $\sin^2 x + \sin^2 (x + \frac{\pi}{3}) + \sin^2 (x - \frac{\pi}{3}) = \frac{3}{2}$

Q33. The following table gives the number of finished articles turned out per day by different numbers of workers in a factory. Find the standard deviation of the daily output of finished articles.

Number of articles	18	19	20	21	22	23	24	25	26	27
No. of workers	3	7	11	14	18	17	13	8	5	4

Q34. Find the equation of the circle which passes through the points (20,3), (19, 8) and (2, -9). Find its centre and radius.

Or

Find the equation of the ellipse whose centre is at the origin, foci are (1, 0) and (-1, 0) and eccentricity is $\frac{1}{2}$

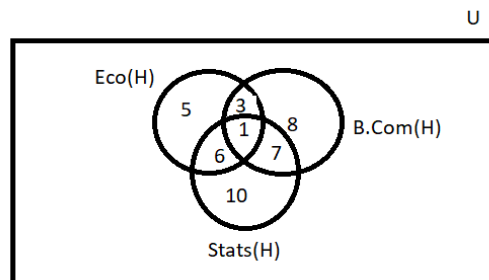
Q35. How many four letter words can be formed out of the letters of the word 'MATHEMATICS'.

SECTION E

Q36. Venn diagrams are the diagrams used to visually depict sets, relationships between sets, and operations on sets. The Venn diagram shows the relationship among sets using circles and the area they cover concerning each other.

Using the knowledge of the venn diagram. Read the following passage and answer the questions.

Saksham is planning to take admission in a college after appearing for CUET exams. He is interested in applying for three courses, Economics (hons.), B.Com.(Hons.) and Statistics (Hons.). Some colleges are shortlisted by him from 50 colleges. He created a Venn diagram to understand his choices as shown below:



- (i) How many colleges Saksham has shortlisted only for Economics (Hons.). (1)
- (ii) How many colleges he has not shortlisted. (1)
- (iii) How many colleges he has shortlisted for B.Com.(Hons.) or Statistics (Hons.). (2)

Or

- (iii) How many colleges he has shortlisted for Statistics (Hons.) but not for Economics (Hons.).

Q37. Read the Information given carefully:

An urn contains twenty white slips of paper numbered from 1 to 20, ten red slips of paper numbered from 1 to 10, forty yellow slips of paper numbered from 1 to 40, and ten blue slips of paper numbered from 1 to 10. In total there are 80 slips of paper which are mixed thoroughly and well shuffled so that each slip has the same probability of being drawn.

Based on above information answer the following Question

- (i) A slip is drawn at random from the urn. What is the probability that it is a blue or a white slip. (1)
- (ii) A slip is drawn at random from the urn. What is the probability that the slip is numbered 1,2,3,4 or 5? (1)
- (iii) A slip is drawn at random from the urn. What is the probability that it is a red or a yellow slip numbered 1,2,3, or 4? (2)

Or

(iii) A slip is drawn at random from the urn. What is the probability that the slip is numbered 20,30 or 40?

Q38. Consider this case study in which Rahul observed a Snail which started moving towards a target 3 m away at a speed of 1 m per hour. Due to tiredness, it was able to cover only half of the distance of the previous hour in each succeeding hour.



Based on the Rahul's observations answer the following:

- (i) How much distance will it travel in the 5th hour? (2)
- (ii) Will it ever reach its target? Explain your answer. (2)