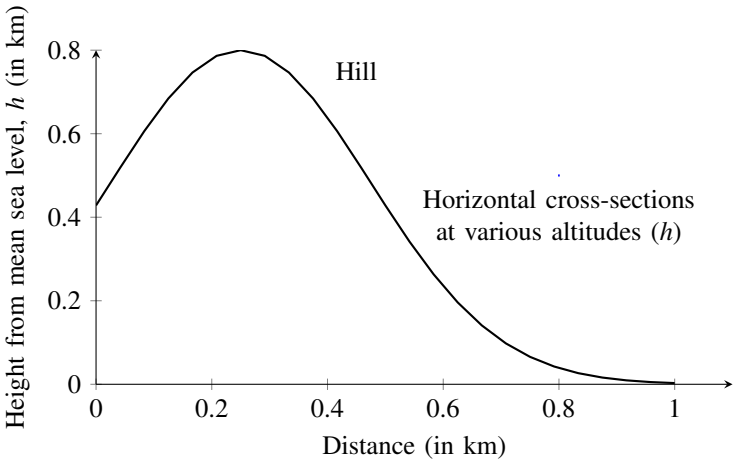
2023-GATE-MA-1-13

EE24BTECH11029- JANAGANI SHRETHAN REDDY

1) The village was nestled in a green spot,___ the ocean and the hills.
   a) through
   b) in
   c) at
   d) between
2) Disagree : Protest :: Agree : ___
   a) Refuse
   b) Pretext
   c) Recommend
   d) Refute
3) A frabjous number is defined as a 3 digit number with all digits odd, and no two adjacent digits being the same. For example, 137 is a frabjous number, while 133 is not. How many such frabjous numbers exist?
   a) 125
   b) 720
   c) 60
   d) 80
4) Which one among the following statements must be TRUE about the mean and the median of the scores of all candidates for GATE 2023?
   a) The median is at least as large as the mean.
   b) The mean is at least as large as the median.
   c) At most half the candidates have a score that is lager than the median.
   d) At most half the candidates have a score that is lager than the mean.
5) In the given diagram, ovals are marked at different heights (h) of a hill. Which one of the following options P, Q, R,and S depicts the top view of the hill?



a) P
b) Q
c) R
d) S

6) Residency is a famous housing complex with many well-established individuals among its residents. A recent survey conducted among the residents of the complex revealed that all of those residents who are well established in their respective fields happen to be academicians. The survey also revealed that most of these academicians are authors of some best-selling books.
Based only on the information provided above, which one of the following statements can be logically inferred with certainty?

a) Some residents of the complex who are well established in their fields are also authors of some best-selling books
b) All academicians residing in the complex are well established in their fields
c) Some authors of best-selling books are residents of the complex who are well established in their fields
d) Some academicians residing in the complex are well established in their fields.

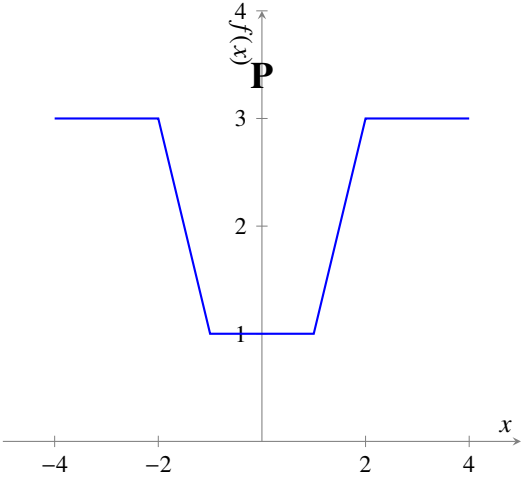
7) Ankita has to climb 5 stairs starting at ground, while respecting the following rules:
1. At any stage, Ankita can move either one or two stairs up.
2. At any stage, Ankita cannot move to a lower step.
Let $F(N)$ denote the number of possible ways in which Ankita can reach the N^{th} stair.For example,$F(1) = 1, F(2) = 2, F(3) = 3$.
The value of $F(5)$ is

a) 8
b) 7
c) 6
d) 5

8) The information contained in DNA is used to synthesize proteins that are necessary for the functioning of life. DNA is composed of four nucleotides: Adenine (A), Thymine (T), Cytosine (C), and Guanine (G). The information contained in DNA can then be thought of as a sequence of these four nucleotides: A, T, C, and G. DNA has coding and non-coding regions. Coding regionsâwhere the sequence of these nucleotides is read in groups of three to produce individual amino acidsâconstitute only about 2% of human DNA. For example, the triplet of nucleotides CCG codes for the amino acid glycine, while the triplet GGA codes for the amino acid proline. Multiple amino acids are then assembled to form a protein.
Based only on the information provided above, which of the following statements can be logically inferred with certainty?
(i) The majority of human DNA has no role in the synthesis of proteins.
(ii) The function of about 98% of human DNA is not understood

a) Only (i)
b) Only (ii)
c) both (i) and (ii)
d) neither (i) nor (ii)

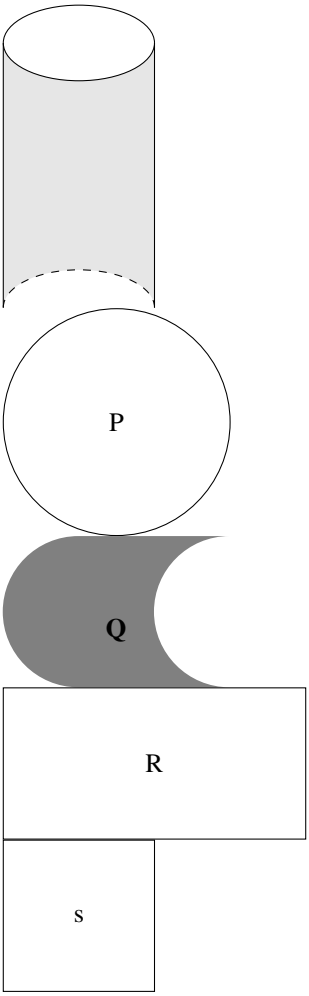
9) Which one of the figures P, Q, R and S represents the graph of the following function?



$f(x) = \|x + 2| - |x - 1\|$

a) P
b) Q
c) R
d) S

10) An opaque cylinder is suspended in the path of a parallel beam of light, such that its shadow is cast on a screen oriented perpendicular to the direction of the light beam. The cylinder can be reoriented in any direction within the light beam. Under these conditions, which one of the shadows P, Q, R, and S is NOT possible?



a) P
b) Q
c) R
d) S

11) Let $f, g\colon \mathbb{R}^2 \to \mathbb{R}$ be defined by
$f(x,y) = x^2 - \frac{3}{2}xy^2$ and $g(x,y) = 4x^4 - 5x^2y + y^2$
for all $(x,y) \in \mathbb{R}^2$
Consider the following statements:
P: f has a saddle point at $(0,0)$. Q: g has a saddle point at $(0,0)$.
Then

a) both p and Q are true
b) both p and Q are false
c) P is FALSE but Q is TRUE

d) Q is FALSE but P is TRUE

12) Let $\mathbb{R}^3$ be a topological space with the usual topology and $\mathbb{Q}$ denote the set of rational numbers. Define the subspaces X, Y, Z and W of $\mathbb{R}^3$ as follows: $X = \left\{(x,y,z) \in \mathbb{R}^3 : \ |x| + |y| + |z| \in \mathbb{Q}\right\}$
$Y = \left\{(x,y,z) \in \mathbb{R}^3 : \ xyz = 1\right\}$
$Z = \left\{(x,y,z) \in \mathbb{R}^3 : \ x^2 + y^2 + z^2 = 1\right\}$
$W = \left\{(x,y,z) \in \mathbb{R}^3 : \ xyz = 0\right\}$
Which of the following statements is correct?

a) X is homeomorphic to Y
b) Z is homeomorphic to W
c) Y is homeomorphic to W
d) X is NOT homeomorphic to W

13) Let $P(x) = 1 + e^{2\pi i x} + 2e^{3\pi i x}, x \in \mathbb{R}, i = \sqrt{-1}$.Then
$\lim_{N\to\infty} \frac{1}{N} \sum_{k=0}^{N-1} P\left(k\sqrt{2}\right)$
is equal to

a) 0
b) 1
c) 3
d) 4