IIITH UGEE REAP (Research Aptitude Test) Question Paper

Time Allowed :1 Hour	**Maximum Marks :**100	**Total Questions :**50

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The Duration of test is 1 Hour.
2. This paper consists of 50 Questions.
3. The test includes Physics, Chemistry and Mathematics (PCM) questions.
4. There will be 50 questions in total from the subject proficiency test section with English as the medium of instruction/ paper.
5. The test has 25 percent negative marking which means 0.25 mark will be deducted for each wrong answer and 2 marks will be rewarded for each correct answer.

1. Two chairs (A and B) are in an empty room overnight. Chair A is made of steel while chair B is made of wood. In the night and in the morning, the temperature of the room is 290 K. In the morning, a person chooses between Chair A and Chair B as the seat by feeling (touching) the chair and choosing one which feels warmer.

(A) BLANK-1: Chair A, Chair B, neither chair

(B) BLANK-2: metal, wood, air, human body

(C) BLANK-3: higher, lower, different, same

(D) BLANK-4: heat capacity, heat conductivity, electrical resistance

(E) BLANK-5: metal, wood, air, human body

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2. Consider a rope fixed at both ends under tension so that it is horizontal (i.e. assume the rope is along x-axis, with gravity acting along z-axis). Now the right end is continually oscillated at high frequency n (say $n = 100$ Hz) horizontally and in a direction along the rope; amplitude of oscillation is negligible. The oscillation travels along the rope and is reflected at the left end.

(A) BLANK-1: travelling, oscillating, stationary, regular

(B) BLANK-2: transverse, longitudinal, regular, irregular

(C) BLANK-3: transverse, longitudinal, regular, irregular

(D) BLANK-4: equal to, half, double, independent from

(E) BLANK-5: $\sqrt{\frac{g}{l}}$, $\sqrt{mg}$, $\sqrt{mgl}$, $\sqrt{\frac{l}{g}}$

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3. When I was a child, there used to be a fair in my town during the Diwali and Id festivities. Among the many things I saw was a strange puppet show. There were three puppets, one of a man, another of a woman, and the third one of a rakshasa (demon). Whenever the rakshasa was brought close to the woman, she would turn her face away. But when the man was brought close to her, she would turn back and face the man.

(A) The strange behaviour of the woman puppet was:

1. definitely because someone was moving it with sticks or strings.

2. definitely because there were magnets fixed in the heads of all three puppets.

3. could be because of magnets in the heads of all three puppets or someone moving them

with sticks or strings.

4. just a random thing. Since we were children then, we thought it was happening in a particular way.

(B) If there were magnets fixed in the heads of the puppets inside the head such that one end of the magnet was at the mouth (M) and the other at the back of the head (B), then the arrangement of the north (N) and south (S) poles of the magnets must be like:

1. man: M-N, B-S; woman: M-N, B-S; demon: M-N, B-S
2. man: M-N, B-S; woman: M-S, B-N; demon: M-S, B-N
3. man: M-S, B-N; woman: M-S, B-N; demon: M-S, B-N
4. man: M-S, B-N; woman: M-N, B-S; demon: M-S, B-N

(C) One of my friends stayed back one day at the show and kept looking at the puppets for a long time. He asked the manager of the show to move the puppets in certain ways. The manager as a kind person and with my friend insisting, he agreed to do what my friend asked for. But he did not tell the friend if there were magnets in the puppets. But the next day, the friend told us that he was sure that there were magnets inside the puppets' faces. What did he ask the manager to do and what could he have seen? He must have seen the effect after asking for moving the puppets:

1. backwards towards each other.
2. at different speeds.
3. up and down.
4. On the same plane, but in different directions.

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4. Your teacher uses a weighing balance to take equal amounts of two substances, tartaric acid and washing soda, say 1g. Each is dissolved separately into 100 cc of water.

(A) In 1 drop of the acid solution and 1 drop of the basic solution, we have:

1. equal amount of acid and base respectively
2. equally acidic and basic substance respectively
3. acidity in one and basicity in the other are not equal
4. equal magnitude of the quantity —pH-7—

(B) Take a few cc of the acidic solution in a test-tube and mix a few drops of coloured

phenolphthaline solution (prepared in basic medium) into it. Which of the following may be happening:

1. The colour of the solution instantly changes pink

2. remains colourless as the colour of the added drops disappears

3. the colour diffuses through the solution and finally disappears

4. the colour diffuses through the solution and finally the entire solution acquires a faint pink colour.

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5. How many solutions are there to the equation $x_1 + x_2 + x_3 + x_4 = 17$, where x_1, x_2, x_3, x_4 are nonnegative integers?

(A) 1140

(B) 1160

(C) 1040

(D) 1200

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6. The function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} 2 + x, & \text{if } x \geq 0 \\ 2 - x, & \text{if } x \leq 0 \end{cases}$$

Then function $f(x)$ at $x = 0$ is:

(A) Continuous and differentiable.

(B) Continuous but not differentiable.

(C) Differentiable but not continuous.

(D) Neither continuous nor differentiable.

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7. Consider a group of 20 people. If everyone shakes hands with everyone else, how many handshakes take place?

(A) ${}^{19}C_2$

(B) ${}^{20}C_2$

(C) ${}^{20}C_{19}$

(D) 20^2

8. A pair of fair dice is rolled. What is the probability that the second die lands on a higher value than the first?

(A) $\frac{1}{36}$

(B) $\frac{5}{36}$

(C) $\frac{1}{6}$

(D) $\frac{5}{12}$

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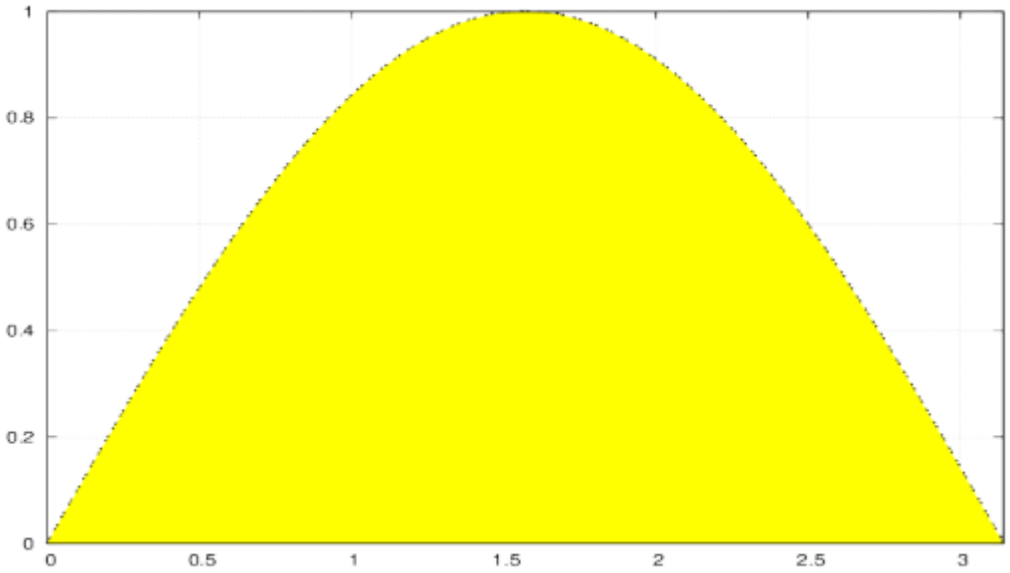
9. This question is based on the below graph: Which number below represents the area of the shaded curve to the closest value?



(A) 1

(B) 1.5

(C) 2

(D) 3

10. Papago Problem: Tohono O'odham, formerly known as Papago, is spoken in south-central Arizona in the U.S. and in northern Sonora in Mexico. Match each Tohono O'odham sentence with its English translation.

(1) Ha-cecposid 'o g wakial g wipsilo. (A) I am speaking

(2) Pi 'ac ñeñok 'a:cim. (B) The man is speaking.

(3) Ceposid 'o g wakial g wisilo. (C) I am working.

(4) Pi 'o cickpan g cecoj. (D) The cowboys aren't branding the calf.

(5) Pi ‘o ceposid g wapkial g wisilo. (E) We are not speaking.

(6) Cipkan ‘añ ‘a:ñi. (F) The men are working.

(7) Ñeok ‘o g ceoj. (G) The cowboy is branding the calf.

(8) Ñeok ‘añ ‘a:ñi. (H) The cowboy is branding the calves.

(I) The men are not working.

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11. Given below is an encrypted sentence: SJ HVJ HMM GPVC BHI. LPBJ VJBHEC LP. – LHBZJM GJFAJXX Decode it based on the clues given below.

Clues: Clue-1: H stands for A

Clue-2: B stands for E

Clue-3: C stands for N

Clue-4: L stands for S

Clue-5: I stands for D

(A) The word **GPVC** is decoded as:

(1) fern (2) born (3) moan (4) burn

(B) The word **HVJ** is decoded as:

(1) pie (2) lie (3) die (4) are

(C) The word **LPBJ** is decoded as:

(1) some (2) sore (3) sole (4) site

12. Swahili, a Bantu language, is spoken in the southern and eastern coasts of Africa. Match the Swahili dates to the correct English translations.

1. tarehe tatu Disemba jumamosi	(A) Monday, October 5th
2. tarehe tano Oktoba jumapili	(B) Tuesday, April 2nd
3. tarehe pili Aprili jumanne	(C) Wednesday, October 5th
4. tarehe tano Oktoba jumatatu	(D) Tuesday, April 4th
5. tarehe nne Aprili jumanne	(E) Sunday, October 5th
6. tarehe tano Oktoba jumatano	(F) Saturday, December 3rd
	(G) Sunday, December 3rd
	(H) Saturday, July 1st
