BITSAT 2023 May 23 Shift 2 Question Paper with Answers (Memory Based)

Question 1. Quality factor: If R is halved keeping L, C same then Q becomes?

Answer: Doubled

Solution: The quality factor (Q) in a series RLC circuit is given by the formula:
$Q = \omega L/R$

Where ω is the angular frequency, L is the inductance, and R is theresistance.

If we halve the resistance (R) while keeping the inductance (L) and capacitance (C) the same, the quality factor (Q) will change.

Let's assume that ω, L, and C remain constant.

If we halve the resistance (R), the new value of Q can be calculated as follows:

$Q' = \omega L/(R/2)$
$= 2\omega L/R$
$= 2Q$

Therefore, if we halve the resistance while keeping the inductance and capacitance the same, the quality factor (Q) will be doubled.

Question 2. Damped oscillation constant decreases then what will be the effect of resonance factor?

Answer: In general, a decrease in the damping constant tends to increase the resonance factor and enhance the potential for resonance in a system, assuming the natural frequency remains constant.

Solution: In a damped oscillation system, the resonance factor is defined as the ratio of the natural frequency of the system to the damping constant.

Resonance Factor = Natural Frequency / Damping Constant

If the damping constant decreases (i.e., the damping decreases), the effect on the resonance factor depends on whether the natural frequency of the system remains constant or changes.

Natural Frequency Unchanged:

If the natural frequency of the system remains constant while the damping constant decreases, then the resonance factor will increase. This means that the system will have a higher resonance factor, indicating that it will be more prone to resonance and exhibit stronger responses at its natural frequency.

Natural Frequency Changed:

If the natural frequency of the system changes while the damping constant decreases, the effect on the resonance factor is not straightforward. It will depend on how the natural frequency and

damping constant are related to each other.

In general, a decrease in the damping constant tends to increase the resonance factor and enhance the potential for resonance in a system, assuming the natural frequency remains constant. However, if the natural frequency also changes, the relationship between the damping constant and resonance factor becomes more complex and will depend on the specific values and characteristics of the system.

Question 3. What is the dimension of the Gravitational constant?

Answer: M-1L3T-2

Question 4. What are the conditions to form an ionic bond?

Answer: Conditions are:

1) An ionic bond is formed only when one of the atoms is metal and the other is non-metal.
2) The metal atom must have low ionization energy so that it can release electrons easily and form a cation.
3) The non-metal should have a high value of electron affinity to attract the electron to form an anion.

Question 5. Which named reaction contains dichlorocarbene intermediate?

A. Aldol condensation
B. Cannizaro
C. Kolbe's reaction
D. Riemen-Tiemann reaction

Answer: Reimen-Tiemann reaction

Solution: Reimer Tiemann reaction which converts phenol to ortho- hydroxybenzaldehyde involves the formation of dichlorocarbene which acts as an electrophile and attacks on the ortho position of phenol.

Question 6. A pack of cards contains 4 aces, 4 kings,4 queens, 4 jacks. Two cards are drawn from the deck, find out the probability that at least one of them is ace.

Answer: 9/20

Solution: To find the probability that at least one of the two cards drawn from the deck is an ace, we need to consider the different scenarios in which this can occur.

Let's calculate the probability using the principle of complementary probability, which states that the probability of an event occurring is equal to 1 minus the probability of the event not occurring.

The total number of ways to choose 2 cards from a deck of 16 cards (4 aces, 4 kings, 4 queens, 4 jacks) is given by the combination formula:

C(16, 2) = 16! / (2! * (16 - 2)!) = 120.

Now let's calculate the probability of drawing two non-ace cards:

The number of ways to choose 2 non-ace cards is given by C(12, 2) since there are 12 non-ace cards in the deck.

C(12, 2) = 12! / (2! * (12 - 2)!) = 66.

Therefore, the probability of drawing two non-ace cards is 66/120 = 11/20.

Now, the probability of drawing at least one ace can be calculated as the complement of drawing two non-ace cards:

Probability of drawing at least one ace = 1 - Probability of drawing two non-ace cards.

Probability of drawing at least one ace = 1 - (11/20) = 9/20.

So, the probability that at least one of the two cards drawn is an ace is 9/20.

Question 7. Two concentric circular wire anti-clockwise current I are in two planes inclined at the theta, find B at centre.

Question 8. Two blocks of mass m and 2m are connected with a light rod and are left to free fall, heavier mass is at the last end of the rod. The rod is vertical throughout the motion. Find tension in the rod.

Question 9. Volume of a block was given. 25% of it was submerged in the water (density 103). Find the force required to keep the full body inside the water fully submerged.

Question 10. A parallel plate of dimension 4cmx4cm with a distance between them 0.1mm connected with a voltage of 100V. Find the charge (in terms of epsilon in SI)

Question 11. Vapour pressure of pura A is twice that of pure B. Find the ratio of mole fractions of A to B if their Ya/Yb was equimolar in vapour phase.

Question 12. Given the quadratic equation ax2 + bx + c = 0, (a>0, b>0, c>0) will have what type of roots?

A. Complex
B. Real and Positive
C. Real part will be negative
D. None of the above

Question 13. Roots of f1(x) = ax2+bx+5 and f2(x) = px2+qx+10 are same then find the value of f2(10)/f1(5)

Question 14. Coefficient of x15 in (x - 1)(x - 2)....(x - 16).