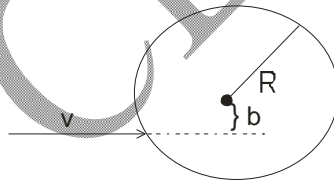


JEST - 2010

QUESTIONS (MEMORY BASED)

- If x and y are two non zero integers then $x^2 + xy + y^2$ is
 (A) Always positive (B) Always negative
 (C) Zero (D) Sometimes positive , Sometime negative
- $\lim_{z \rightarrow 0} \left[\frac{\text{Re } Z^2 + \text{Im } Z^2}{Z^2} \right] = ?$
 (A) Undefined (B) 1 (C) $-i$ (D) $= -1$
- If a person has a meter scale and he has to measure a length of 50 m. Each time he measures the measurement lies from 99.8 to 100.2 cm. Estimate the net error, when he takes measurement 50 times?
- If a proton and an alpha particle are accelerated by same potential V , then the ratio of the wavelength of proton to alpha particle is
 (A) 2 : 1 (B) 1 : 2 (C) $2\sqrt{2} : 1$ (D) 1 : 1
- If p and q are two distinct primes , then the no. of divisors of $p^2 q^3$ is ,
 (A) 10 (B) 12 (C) 8 (D) 6
- A particle moving with velocity v hits the uniform circular disc at rest with impact parameter ($b < R$). Afterwards both particles and disc rotates with same angular velocity ω , then ω in terms of v is



- For a two state physical system, an observable A is represented by matrix

$$A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

then

- An exact measurement of A can yield any number between $-\infty$ and $+\infty$ as a possible result
- $0 \leq \langle A \rangle \leq 2$ for every physical state of the system
- $\langle A \rangle = 1$ for every physical state of the system
- $0 \leq \langle A \rangle \leq 1$ for every physical state of the system

8. Solve the D.E.

$$x \frac{dy}{dx} - 3y = x^2$$

(A) $y = -x^2 + cx^3$

(C) $yx = -x^2 + cx^2$

(B) $y/x = -x^2 + cx^4$

(D) $y = x^2 - cx^3$

9. Find $\sum_{k=1}^5 \sum_{\ell=1}^k (1+2+\dots+\ell)$

(A) 55

(B) 35

(C) 15

(D) 70

10. ^{12}C , ^{17}O find the spin angular momentum with parity?

(A) $0^+, 3/2^-$

(B) $0^+, 3/2^+$

(C) $0^+, 5/2^+$

(D) $0^+, 5/2^-$

11. 4 particles, 3 states find the relation between E_B , E_F , E_{Cl} .

$E_B \rightarrow$ Bose Einstein energy

$E_F \rightarrow$ Fermi dirac energy

$E_{cl} \rightarrow$ Classical energy

(A) $E_B > E_F > E_{cl}$

(B) $E_B = E_{cl} > E_F$

(C) $E_{cl} > E_B > E_F$

(D) $E_{cl} > E_F > E_B$

12. Evaluate $\frac{1}{2\pi i} \oint \frac{z}{z^2 + 2z - 3i}$

(A) $\frac{1}{2\pi i}$

(B) 1

(C) 0

(D) $\frac{1}{\pi i}$

13. A ball is thrown 1m above from the earth it is bounce at 95 cm. Now calculate the distance traveling by it.

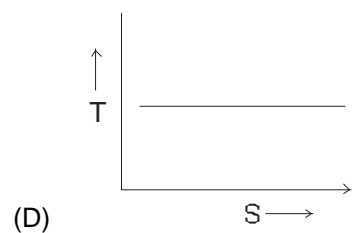
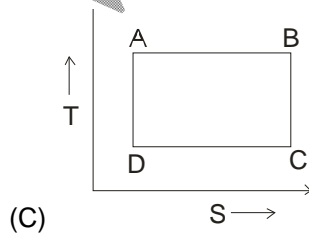
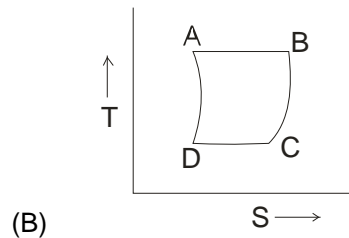
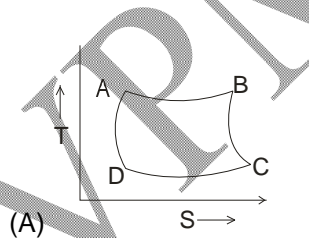
(A) 3999 cm

(B) 2900 cm

(C) 3900 cm

(D) 4000 cm

14. Draw the T-S diagram for carnot cycle?



15. $\phi(r, \theta) = -E_0 r \left[1 - \left(\frac{a}{r} \right)^3 \cos \theta \right]$

(Potential distribution of sphere of charge q)

Find the charge distribution

- (A) $E_0 \left[\frac{a}{r} \right]^2$ (B) $E_0 a^3$ (C) $E_0 a^2$ (D) $\frac{E_0}{2\pi r}$

16. For fcc lead crystal the distance between plane (1 0 0) is 2.40 \AA then calculate the number of unit cell?

- (A) 13.2×10^{25} (B) 11.2×10^{23}
 (C) 13.6×10^{22} (D) 13.2×10^{26}

17. The energy of spin state is hs and calculate the value of entropy at $T = 0$ and $T = \infty$ in term of Boltzmann constant K . Given energy $E = 0, \pm 1$

18. If $(2^P - 1)$ is a prime, then
 (A) P may be composite (B) P is a prime
 (C) P is necessarily composite (D) none of these

19. Two light sources are separated by 50km, both emit a light signal from lab reference frame. One source emits the signal $5 \mu\text{s}$ after the other source which is moving with a velocity ' v ' w.r.t lab along the light signal, two sources appear to emit simultaneously. So calculate the value of ' v '?

- (A) $0.5 c$ (B) $0.8c$ (C) $0.7c$ (D) $0.9c$

20. What is the volume of a sphere of unit radius in 4 - dimensions?

- (A) $\frac{8\pi^2}{15}$ (B) $\frac{\pi^2}{2}$
 (C) $\frac{\pi^3}{6}$ (D) $\frac{4\pi}{3}$

21. A proton accelerated by a potential difference of 1000 V and enters into magnetic field $B = 1000 \text{ T}$ along a circular path of $r = 20 \text{ cm}$. Determine the velocity of proton during circular motion.

- (A) $1.9 \times 10^{10} \text{ m/sec}$ (B) $2.9 \times 10^9 \text{ m/sec}$
 (C) $1.5 \times 10^{10} \text{ m/sec}$ (D) $3.1 \times 10^9 \text{ m/sec}$

22. If donors are added to n-type semiconductor then

- (i) Electrons increase holes remain constant
 (ii) Electrons increases holes decreases
 (iii) Electrons increases holes increases
 (iv) No effect will take place

23. Matrix $A = \begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 1 \end{bmatrix}$

Calculate the eigen value and eigen vector?

(A) 0,3; $x_1 = \begin{bmatrix} -\sqrt{2} \\ 1 \end{bmatrix}, x_2 = \begin{bmatrix} \sqrt{2} \\ 1 \end{bmatrix}$

(B) 0,2; $x_1 = \begin{bmatrix} 1 \\ -\sqrt{2} \end{bmatrix}, x_2 = \begin{bmatrix} \sqrt{2} \\ 1 \end{bmatrix}$

(C) 0,3; $x_1 = \begin{bmatrix} 1 \\ -\sqrt{2} \end{bmatrix}, x_2 = \begin{bmatrix} \sqrt{2} \\ 1 \end{bmatrix}$

(D) 0,3; $x_1 = \begin{bmatrix} 1 \\ -\sqrt{2} \end{bmatrix}, x_2 = \begin{bmatrix} \sqrt{2} \\ 1 \end{bmatrix}$

24. A mass m is attached to a spring with one end to a rigid support and to other end a spring is connected which is attached to a mass m , having some spring constant calculate the normal modes frequency.

(A) $\omega = \sqrt{\frac{K}{2m}}$

(B) $\omega = \sqrt{\frac{2K}{m}}$

(C) $\omega = \sqrt{\frac{3K}{2m}}$

(D) $\omega = \sqrt{\frac{2K}{3m}}$

25. A star of radius 7000 Km. is radiating power at 6.667 M Watt. Then find the frequency of star?

(A) 1.0×10^{11} Hz

(B) 1.9×10^{12} Hz

(C) 1.0×10^{12} Hz

(D) 1.9×10^{11} Hz

ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B		C	B		D	A	B	C
Ques.	11	12	13	14	15	16	17	18	19	20
Ans.	C	B	C	C	C	D		A	D	B
Ques.	21	22	23	24	25					
Ans.	A	A	C	B	A					