## Target |IT-JAM-2019

## Test Series-6

FULL LENGTH TEST - 3
Booklet Code: F

## Duration: 3:00 Hours

Date: 28-01-2019
Maximum Marks: 100

## Read the following instructions carefully:

1 Attempt all the questions.
2. Section-A contains $\mathbf{3 0}$ Multiple Choice Questions (MCQ). Each question has 4 choices (a), (b), (c) and (d), for its answer, out of which ONLY ONE is correct. From Q. 1 to Q. 10 carries 1 Marks and Q. 11 to Q. 30 carries 2 Marks each.
3. Section-B contains $\mathbf{1 0}$ Multiple Select Questions(MSQ). Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which ONE or MORE than ONE is/are correct. For each correct answer you will be awarded 2 marks.
4. Section-C contains 20 Numerical Answer Type (NAT) questions. From Q. 41 to Q. 50 carries 1 Mark each and Q. 51 to Q. 60 carries 2 Marks each. For each NAT type question, the value of answer can be any real number.
5. In all sections, questions not attempted will result in zero mark. In Section-A (MCQ), wrong answer will result in negative marks. For all 1 mark questions, $\mathbf{1 / 3}$ marks will be deducted for each wrong answer. For all $\mathbf{2}$ marks questions, $\mathbf{2} / \mathbf{3}$ marks will be deducted for each wrong answer. In Section-B (MSQ),there is no negative and no partial marking provision. There is no negative marking in Section-C (NAT) as well.

Regn. No.
Name of Student Batch

College/University

## CAREER ENDEAVOUR

Best Institute for IIT-JAM, NET \& GATE

33-35, M all Road, G.T.B. Nagar,
Opp. G.T.B. Nagar M etro Station
Gate No. 3, Delhi-110 009
T:011-27653355, 27654455

REGISTERED OFFICE :
28-A/11, Jia Sarai, Near IIT
M etro Station, Gate No. 3,
New Delhi-110 016
T: 011-26851008, 26861009
E : info@careerendeavour.in

## For Online Test

www.careerendeavouronlinetest.com

DOW NLOAD CAREER ENDEAVOUR APP

## [PART-A : MULTIPLE CHOICE QUESTIONS (MCQ)]

## Q. 1 To Q. 10 : Each carry ONE mark

1. The coefficient of $(x-1)^{3}$ of Taylor series expansion $f(x)=(x-1) e^{x}$ about $\mathrm{x}=1$, is
(a) $e / 6$
(b) $e / 2$
(c) $-e / 2$
(d) $-e / 6$
2. The principal value of the solution of the equation $e^{z}=1+i$ in the complex argand plane, is
(a) $\ln 2+i \frac{\pi}{4}$
(b) $\ln 2-i \frac{\pi}{4}$
(c) $\frac{1}{2} \ln 2-i \frac{\pi}{4}$
(d) $\frac{1}{2} \ln 2+i \frac{\pi}{4}$
3. A subatomic particle produced in a nuclear collision is found to have a mass such that $M c^{2}=(1228 \pm 56) \mathrm{MeV}$. The lifetime of the state can be estimated to be
(a) $3.25 \times 10^{-24} \mathrm{sec}$
(b) $4.41 \times 10^{-24} \mathrm{sec}$
(c) $5.86 \times 10^{-24} \mathrm{sec}$
(d) $6.37 \times 10^{-24} \mathrm{sec}$
4. The mean free path of the molecules of an ideal gas at $25^{\circ} \mathrm{C}$ is $2.63 \times 10^{-5} \mathrm{~m}$. If the radius of each molecule is $2.56 \times 10^{-10} \mathrm{~m}$, the pressure of the gas is approximately
(a) $321 \mathrm{~N} / \mathrm{m}^{2}$
(b) $134 \mathrm{~N} / \mathrm{m}^{2}$
(c) $237 \mathrm{~N} / \mathrm{m}^{2}$
(d) $802 \mathrm{~N} / \mathrm{m}^{2}$
5. A uniform rope of mass $m$ and length $l$ is attached to a block of mass $M$. The rope is pulled with force $F$. Neglecting gravity, the tension at distance $x$ from the end of the rope is
(a) $\frac{x}{l} F$
(b) $F$

(c) $\left[1-\frac{m}{M+m}\left(\frac{x}{l}\right)\right] F$
(d) $\frac{m}{M+m}\left(\frac{x}{l}\right) F$
6. Light of wavelength 500 nm illuminates parallel slits and produces an interference pattern on a screen that is 1 m from the slits. In terms of the initial intensity $I_{0}$, the lights intensity in the interference pattern at a point for which the path difference is 100 nm is
(a) $3.81 I_{0}$
(b) $2.61 I_{0}$
(c) $1.23 I_{0}$
(d) $0.123 I_{0}$
7. A sample of radioactive element has a mass of 10 gm at an instant $t=0$. The approximate mass of this element in the sample after two mean lives is
(a) 2.50 gm
(b) 3.70 gm
(c) 6.30 gm
(d) 1.35 gm
8. The circuit in the figure is a

(a) low-pass filter
(b) high-pass filter
(c) band-pass filter
(d) band-reject filter
9. Suppose $A B C$ is an equilateral triangle of side $a$. $Q$ charged is placed at a distance $d$ from $A$ as shown in figure. The work done required to bring unit charge from $C-A$ via $B$ is
(a) $\frac{Q}{4 \pi \varepsilon_{0}} \frac{a}{d(d+a)}$
(b) $\frac{Q}{4 \pi \varepsilon_{0}} \frac{d}{d(d-a)}$
(c) $\frac{\sqrt{3} Q}{4 \pi \varepsilon_{0} a}$
(d) $\frac{\sqrt{3} Q}{8 \pi \varepsilon_{0} a}$

10. Three wire is placed in $x y$-plane as shown in figure. The magnetic field at the centre is
(a) $\frac{\mu_{0} I}{2 \pi d}$
(b) $\frac{3 \mu_{0} I}{2 \pi d}$
(c) $\frac{\mu_{0} I}{\pi d}$
(d) zero

## Q. 11 To Q. 30 : Each carry TWO marks


11. Consider the differential equation: $\frac{d^{3} y}{d x^{3}}+3 \frac{d^{2} y}{d x^{2}}-4 y=0$ under the conditions $y(0)=1$, $y^{\prime}(0)=0, y^{\prime \prime}(0)=1 / 2$. The value of $y(1)$ will be
(a) $\frac{1}{2}\left(e+\frac{2}{e^{2}}\right)$
(b) $\frac{1}{2}\left(e-\frac{2}{e^{2}}\right)$
(c) $\frac{1}{2}\left(e-\frac{2}{e}\right)$
(d) $\frac{1}{2}\left(e+\frac{2}{e}\right)$
12. The value of the limit: $\operatorname{Lim}_{x \rightarrow \infty} x \tan \left(\frac{1}{x}\right)$ will be
(a) 0
(b) not defined
(c) $2 / \pi$
(d) 1
13. The energy eigenvalue and the corresponding eigenfucntion for a particle of mass $m$ in a 1-D potential $V(x)$ are

$$
E=0, \psi(x)=\frac{A}{x^{2}+a^{2}}
$$

The potential $V(x)$ will be proportional to (if $x \gg a$ )
(a) $1 / x$
(b) $1 / x^{2}$
(c) $1 / x^{4}$
(d) $x^{2}$
14. Consider the operator $\hat{A}=i\left(\hat{x}^{2}+1\right) \frac{d}{d x}+i \hat{x}$ such that $\hat{A} \psi(x)=0$. The probability of finding the particle in the region $-1 \leq x \leq 1$, will be
(a) $1 / 2$
(b) $1 / 3$
(c) $1 / 4$
(d) $3 / 4$
15. If the coefficient of volume expansion of a substance is given by $\alpha=\frac{b T^{2}}{P}$, where $b$ is some constant and its volume is $V_{0}$ at zero Kelvin, its equation of state is
(a) $V_{0} \exp \left(\frac{a T^{3}}{P}\right)$
(b) $-V_{0} \exp \left(\frac{a T^{3}}{P}\right)$
(c) $V_{0} \exp \left(-\frac{a T^{3}}{P}\right)$
(d) $-V_{0} \exp \left(-\frac{a T^{3}}{P}\right)$
16. A reversible heat engine converts one-sixth of the heat into work. When the temperature of the sink is reduced by $62^{\circ} \mathrm{C}$, its efficiency is doubled. The temperatures of the source and the sink, respectively, are
(a) $104^{\circ} \mathrm{C}, 23^{\circ} \mathrm{C}$
(b) $73^{\circ} \mathrm{C}, 27^{\circ} \mathrm{C}$
(c) $99^{\circ} \mathrm{C}, 37^{\circ} \mathrm{C}$
(d) $62^{\circ} \mathrm{C}, 26^{\circ} \mathrm{C}$
17. 10 g water at $60^{\circ} \mathrm{C}$ is mixed with 30 g water at $20^{\circ} \mathrm{C}$ in an adiabatic container. The entropy change of the universe (in $\mathrm{Cal} / \mathrm{K}$ ) is
(a) 0.083
(b) 0.070
(c) 0.090
(d) 0.063
18. Which of the following is an incorrect Maxwell thermodynamics relations?
(a) $\left(\frac{\partial T}{\partial P}\right)_{S}=\left(\frac{\partial V}{\partial S}\right)_{P}$
(b) $\left(\frac{\partial S}{\partial P}\right)_{T}=-\left(\frac{\partial V}{\partial T}\right)_{P}$
(c) $\left(\frac{\partial S}{\partial V}\right)_{T}=\left(\frac{\partial P}{\partial T}\right)_{V}$
(d) $\left(\frac{\partial T}{\partial V}\right)_{S}=\left(\frac{\partial P}{\partial S}\right)_{V}$
19. Consider a particle moving in two dimensions whose position vector is given by $\vec{r}=A\left(e^{\alpha t} \hat{i}+e^{-\alpha t} \hat{j}\right)$, where $A$ and $\alpha$ are constants. Which among the following graphs correctly represents the trajectory of the particle?
(a)

(b)

(c)

(d)

20. A 5 kg mass moves under the influence of a force $\vec{F}=\left(4 t^{2} \hat{i}-3 t \hat{j}\right) N$, where $t$ is the time in seconds. It starts at rest from the origin at $t=0$. The angular momentum $\vec{L}$ of the object at $t=150^{1 / 6} \mathrm{sec}$, is
(a) $-\frac{1}{50} \hat{i}+\frac{2}{75} \hat{j}$
(b) $-3 \hat{i}+4 \hat{j}$
(c) $150^{1 / 3} \hat{k}$
(d) $1 \hat{k}$
21. The mass per unit length of a non-uniform rod of length $l$ is given by $\lambda=A \cos \left(\frac{\pi x}{2 l}\right)$, where $x$ is position along the rod, $0 \leq x \leq l$. The centre of mass of the rod is
(a) $l\left(1-\frac{2}{\pi}\right)$
(b) $\frac{l}{\pi}$
(c) $l\left(1-\frac{1}{\pi}\right)$
(d) $\frac{2 l}{\pi}$
22. Consider the spring and mass arrangement below with no mass the spring has a rest length $x_{0}$. Now a mass $m$ is introduced as shown. Which curve in the box best represents the variation in total potential energy of this system?

(a) curve number 1
(b) curve number 2
(c) curve number 3
(d) curve number 4
23. A plane wave $(\hat{x}+i \hat{y}) E_{0} \exp [i(k z-\omega t)]$, after passing through an optical elementemerges as $(\hat{x}-i \hat{y}) E_{0} \exp [i(k z-\omega t)]$, where $k$ and $\omega$ are the wave-vector and angular frequency, respectively. The optical element is
(a) quarter wave plate
(b) half wave plate
(c) polarizer
(d) simple glass plate
24. Suppose you observe total 15 bright fringes within first diffraction envelope of a double-slit diffraction pattern. If you know that the separation of the slits $\mathrm{d}=10 \mathrm{~mm}$, you can conclude that the width of each slit is
(a) 2.45 mm
(b) 1.25 mm
(c) 1.65 mm
(d) 1.38 mm
25. A beam of sodium light of wavelength 589 nm is incident on a diffraction grating as shown in figure. If the second order diffraction maximum is observed at 25 degrees to the normal, then the number of lines per cm of the grating is (Given $\sin 25=0.4226$ )

(a) 450
(b) 723
(c) 657
(d) 578
26. In a crystalline solid, the energy band structure ( $E-k$ relation) for an electron of mass $m$ is given by

$$
E=\frac{\hbar^{2}}{2 m}(k+2)(4 k+7)
$$

The effective mass $\left(m^{*}\right)$ of the electron in the crystal is equal to
(a) $m / 2$
(b) $4 m$
(c) $m / 3$
(d) $m / 4$
27. In figure, if the input is a sinusoidal signal, the output will appear as shown in
(a)

(b)

(c)

(d)


28. The function of the following circuit, if the input is a sine wave, is that it

(a) Transmits that part of sine wave, which is above +8 V and below +4 V
(b) Transmits that part of sine wave, which lies between +4 V and +8 V
(c) Transmits that part of sine wave, which lies above -4 V and below +8 V
(d) Transmits that part of sine wave, which lies above +4 V and above -8 V
29. An electric dipole of dipole moment $P_{0}$ is placed in $x y$-plane making an angle $30^{\circ}$ with the $x$-axis. The magnitude of electric field at $(d, 0,0)$ is given by
(a) $\frac{P_{0} \sqrt{3}}{8 \pi \varepsilon_{0} d^{3}}$
(b) $\frac{P_{0} \sqrt{13}}{8 \pi \varepsilon_{0} d^{3}}$
(c) $\frac{P_{0}}{4 \pi \varepsilon_{0} d^{3}}$
(d) zero
30. A spherical shell of radius $R$, centered at the origin, has potential,

$$
V= \begin{cases}V_{0} & \text { for } r<R \\ \frac{V_{0} R}{r} & \text { for } r>R\end{cases}
$$

The electrostatics energy stored in the system is
(a) $4 \pi \varepsilon_{0} V_{0} R$
(b) $4 \pi \varepsilon_{0} V_{0}^{2} R$
(c) $2 \pi \varepsilon_{0} V_{0}^{2} R$
(d) $2 \pi \varepsilon_{0} V_{0} R$

## [PART-B : MULTIPLE SELECTIVE QUESTIONS (MSQ)]

## Q. 31 To Q. 40 : Each carry TWO marks

31. Which of the following statements is/are CORRECT?
(a) For any square matrix $A, A^{T} A$ will be always a symmetric matrix.
(b) If a matrix $A$ is both unitary and hermitian, then $A=A^{-1}$.
(c) If $A$ is a symmetric matrix, then it can be digonalized using an orthogonal matrix.
(d) If $A$ is similar to $B$, then $A^{m}$ will always be similar to $B^{m}$ ( $m$ is a positive integer).
32. Consider a system of $N$ classical particles, each of which can have an energy 0 and $E$. The system is in thermal equilibrium at temperature $T$. Which of the following is/are correct(s)?
(a) The Helmholtz free energy is $-N k_{B} T \ln \left(1+e^{-E / k_{B} T}\right)$
(b) The average total energy of the system is $\frac{N E}{1+e^{E / k_{B} T}}$
(c) The average total energy of the system is $\frac{N E}{1+e^{-E / k_{B} T}}$
(d) The ratio of fraction of particles in the upper and lower energy level is $e^{E / k_{B} T}$
33. Consider a cylindrical drum of radius $b$, mass $M$ and weight $M g$ on a rough inclined plane of angle $\theta$. If the drum starts from rest and rolls without slipping, then which of the following statements is/are CORRECT?
(a) the friction force is not dissipative.
(b) some of the mechanical energy is dissipated as heat.
(c) the speed of centre of mass after it has descended a height $h$, is $\sqrt{4 g h / 3}$.
(d) the friction decreases the translational energy by an amount $2 f \frac{h}{\sin \theta}$, where $f$ is friction force.
34. Suppose that a raindrop falls through a cloud and accumulates mass at a rate $k m v$, where $k>0$ is a constant. If it starts from rest, then at a given time $t$, which of the following is/are correct?
(a) The speed of the raindrop is $v=\sqrt{\frac{g}{k}} \tanh (\sqrt{k g} t)$.
(b) The speed of the raindrop is $v=\sqrt{\frac{g}{k}} \operatorname{coth}(\sqrt{k g} t)$.
(c) The mass of the raindrop is $m=m_{0} \cosh (\sqrt{k g} t)$, where $m_{0}$ is its initial mass.
(d) The mass of the raindrop is $m=m_{0} \sinh (\sqrt{k g} t)$.
35. A quarter wave plate ( QWP ) is rotated between two cross polarizer (i.e., at $90^{\circ}$ ) as shown in figure.


Let optical axis of QWP at any instant make an angle $\phi$ with the $y$-axis. If intensity of light emerging out of $P_{2}$ is $I_{2}$, then which of the following statements is/are CORRECT?
(a) when $\phi=0, I_{2}=0$
(b) when $\phi=90^{\circ}, I_{2}=\frac{I_{0}}{2}$
(c) when $\phi=45^{\circ}, I_{2}=\frac{I_{0}}{4}$
(d) when $\phi=60^{\circ}, I_{2}=0$
36. Consider a Newton's ring apparatus as shown in figure.

Newton's ring is observed in reflected light as shown.
Then which of the following statements is/are CORRECT?
(a) when $1.5<n<1.6$, central ring will be bright.
(b) when $1.5<n<1.6$, central ring will be dark.

(c) diameter of $5^{\text {th }}$ ring (dark or bright) changes from 5 mm to 4.5 mm , when air is replaced by the liquid of $n=1.23$.
(d) diameter of $5^{\text {th }}$ ring (dark or bright) changes from 5 mm to 4.5 mm , when air is replaced by the liquid of $n=1.75$.
37. Which of the following statement(s) is/are correct for the semiconductors?
(a) A phosphorus doped silicon semiconductor is heated from $100^{\circ} \mathrm{C}$ to $200^{\circ} \mathrm{C}$. The position of Fermi level moves towards conduction band.
(b) The Fermi level in an $n$-type semiconductor at 0 K lies half way between the conduction band and donor level.
(c) In an $n$-type semiconductor, as the density of donor atoms $N_{d}$ is increased, the Fermi level shifts towards the conduction band.
(d) In a $p$-type semiconductor, as the density of acceptor atoms $N_{a}$ is increased, the Fermi level shifts towards the valance band.
38. A point charge $Q$ is placed at some distance from grounded conducting spherical shell as shown in figure: Which of the following statement(s) is/are correct?
(a) Electric field inside the shell is zero.
(b) Electric potential at centre of shell is zero.
(c) Charge distribution of on the shell is non uniform.

(d) If grounding is removed then charge distribution on the shell changes.
39. The electric field of an electromagnetic wave is given by

$$
\vec{E}=\hat{i} E_{0} \sin (\omega t-k z)+\hat{j} E_{0} \cos (\omega t+k z) .
$$

In free space, choose the correct statement(s) :
(a) The magnetic field $\vec{B}=\frac{E_{0}}{c}(\hat{i} \sin (\omega t-k z)+\hat{j} \cos (\omega t+k z))$
(b) The magnetic field $\vec{B}=\frac{E_{0}}{c}(\hat{i} \sin (\omega t-k z)-\hat{j} \cos (\omega t+k z))$
(c) The time average Poynting vector $\langle\vec{S}\rangle=\frac{E_{0}^{2}}{c \mu_{0}} \sin (2 k z)$
(d) The time average Poynting vector $\langle\vec{S}\rangle=0$
40. Suppose $\phi_{1}, \phi_{2}$ and $\phi_{3}$ are the eigenstates of particle in box of energy $E_{1}, E_{2}$ and $E_{3}$ respectively, at $t=0$ the wave function of the particle

$$
\psi(x, 0)=\frac{1}{\sqrt{2}}\left|\phi_{1}\right\rangle+\frac{1}{\sqrt{6}}\left|\phi_{2}\right\rangle+\frac{1}{\sqrt{3}}\left|\phi_{3}\right\rangle
$$

Which of the following statement(s) is/are correct?
(a) The probability getting the particle in $\left|\phi_{2}\right\rangle$ is $1 / 6$.
(b) The average energy of the particle at time $t$ is $\frac{23 \hbar^{2} \pi^{2}}{12 m L^{2}}$.
(c) $\psi$ is an eigen function of $\hat{H}$ of the system.
(d) $\psi$ is an eigen function of momentum operator.

## [PART-C : NUMERICAL ANSWER TYPE QUESTIONS (NAT)]

## Q. 41 To Q. 50 : Each carry ONE mark

41. In the fourier series expansion of the function: $f(x)=\left\{\begin{array}{ll}\pi+x & \text { for }-\pi<x<0 \\ 0 & \text { for } 0<x<\pi\end{array} ; f(x+2 \pi)=f(x)\right.$.

The fourier coefficient $a_{100}$ will be $\qquad$ $\times \frac{2}{\pi}$. [Specify your answer in integer]
42. Consider the following transformation of co-ordinates from $(x, y)$ to $(u, v)$ :

$$
u=y-x, v=y+x
$$

The Jacobian of $(x, y)$ w.r.t. $(u, v)$, will be $\qquad$ . [Specify your answer one place after decimal]
43. When radiation of wavelength 150 nm is incident on a photocell, electrons are emitted. If the stopping potential is 4.4 Volts, then the threshold wavelength is $\qquad$ (in the units of nm and answer should be an integer)
44. The degeneracy of the $n=5$ state of a 3-D isotropic harmonic oscillator will be $\qquad$ . (Answer should be an integer)
45. Out of the quantities Gibbs free energy, entropy, volume, internal energy and enthalpy, the number of discontinuous quantities at transition point in first order phase transition is $\qquad$ _. (Specify your answer in integer)
46. A ball is projected from the ground at an angle of $45^{\circ}$ with the horizontal surface. It reaches a maximum height of 120 m and returns to the ground. Upon hitting the ground for the first time, it loses half of its kinetic energy. Immediately after the bounce, the velocity of the ball makes an angle of $30^{\circ}$ with horizontal surface. The maximum height it reaches after the bounces is $\qquad$ (in metres).
[Specify your answer in integer]
47. Consider a uniform thin square lamina of side $a$ and mass $M$. Acircle of diameter $a / 2$ with its centre coinciding with the centre of the square, is cut from the square lamina.


If the moment of inertia of the resultant object about an axis passing through centre of object and perpendicular to it, is $\beta M a^{2}$, then the value of $\beta$ is $\qquad$ . (Answer upto two decimal places)
48. Light is incident from a medium of refractive index $n=1.5$ on to vacuum. The smallest angle of incidence for which the light is not transmitted into vaccume is $\qquad$ (degree).
(Answer upto two decimal places)
49. The lattice parameters $a, b$ and $c$ of an orthorhombic crystal are related by $a=2 b=3 c$. In units of $a$, the interplanar separation between the (111) planes is $\qquad$ (Answer upto two decimal places)
50. In the voltage regulator shown in the figure, the load current can vary from 100 mA to 500 mA . Assuming that the Zener knee current is negligibly small and Zener resistance is zero in the breakdown region), the value of $R$ is $\qquad$ $\Omega$.
[Specify your answer in integer]


## Q. 51 To Q. 60 : Each carry TWO marks

51. Consider the vector field: $\vec{A}=(3 x-y) \hat{i}-2 y z^{2} \hat{j}-2 y^{2} z \hat{k}$. The value of the integral $\iint_{S}(\vec{\nabla} \times \vec{A}) \cdot \hat{n} d S$, where $S$ is the surface defined by the equation $x^{2}+y^{2}+z^{2}=16, z \geq 0$, will be equal to $\qquad$ . (in the units of $\pi$ ). [Specify your answer in integer]
52. Consider a particle of mass $m$ moving freely between $x=0$ and $x=a$ inside an infinite square well potential. If the particle is in the third excited state, then the uncertainty product $\Delta x . \Delta p_{x}$ will be $\qquad$ . (in the units of $\hbar$ and upto one decimal place).
53. An electron is confined within a 1-D potential well of width $8 \AA$ and depth 12 eV . The number of bound states of the particle present in the well, will be $\qquad$ . (Answer should be an integer)
54. One mole of an ideal gas at $0^{\circ} \mathrm{C}$, is heated at constant pressure till its volume is twice its initial value. The amount of heat absorbed in the process is $\qquad$ kJ.
(Take $C_{v}=20.9 \mathrm{~J} \mathrm{~mol}^{-1} \mathrm{~K}^{-1}$ and $R=8.3 \mathrm{~J} \mathrm{~mol}^{-1} \mathrm{~K}^{-1}$ )
(Specify your answer one place after decimal point)
55. A bead of mass $m$ slides without friction on a smooth rod along the $x$-axis. The rod is equidistant between two spheres of mass $M$. The spheres are located at $x=0, y= \pm a$ as shown, and attract the bead gravitationally.


If the bead is released at $x=-3 a$ from rest towards the origin, then the momentum of the particle as it
passes the origin is $\beta m \sqrt{\frac{G M}{a}}$. The value of $\beta$ is $\qquad$ . (Answer upto two decimal places)
56. Two identical holes, each having cross-sectional area $S=0.50 \mathrm{~cm}^{2}$, are opened on the opposite sides of a wide vertical vessel filled with water. The difference in height between them is equal to $\Delta h=51 \mathrm{~cm}$. The resultant force of reaction of the water flowing out of the vessel is $\qquad$ (in newton).
(Given acceleration due to gravity $g=10 \mathrm{~ms}^{-2}$, density of water $\rho=1000 \mathrm{~kg} / \mathrm{m}^{3}$ ) (Answer upto two decimal places)
57. In a young's double slit experiment using light, the apparatus has two slits of unequal width. When only slit-1 is open, the maximum observed intensity on the screen's is $4 I_{0}$. When only slit-2 is open, the maximum observed intensity is $I_{0}$. When both the slits are open, an interference pattern appears on the screen. The ratio of the intensity of the principal maximum to that of the minimum is $\qquad$ . [Specify your answer in integer]
58. The energy dependence of the density of states for a one-dimensional non-relativistic electron gas is given by $D(E)=C E^{n}$, where $C$ is a constant. The value of $n$ is $\qquad$ _.
(Specify your answer to one place after decimal point)
59. What are the minimum number of 2-input NAND gates required to generate the following expression, $(\bar{x}+\bar{y})(w+z)$ is $\qquad$ ?
[Specify your answer in integer]
60. In cylinderical coordinates, $B=\frac{2}{r} \hat{\phi} T$. The magnetic flux passing through the surface defined by $0.5 \leq r \leq 2.5$ and $0 \leq z \leq 2.0$ is $\qquad$ Wb. (Upto two decimal places).

## CAREER ENDEAVOUR <br> Best Institute for IIT-JAM, NET \& GATE

IIT-JAM-PHYSICS-PH
Date : 28-01-2019
TEST SERIES - 6

## FULL LENGTH SERIES - 3

## ANSWER KEY

## [PART-A : MULTIPLE CHOICE QUESTIONS (MCQ)]

| 1. (b) | 2. (d) | 3. (c) | 4. (b) | 5. (c) |
| :--- | :--- | :--- | :--- | :--- |
| 6. (b) | 7. (d) | 8. (a) | 9. (a) | 10.(a) |
| 11.(a) | $12 .(d)$ | $13 .(b)$ | $14 .(a)$ | $15 .(a)$ |
| 16.(c) | $17 .(d)$ | $18 .(d)$ | $19 .(d)$ | $20 .(d)$ |
| 21.(a) | $22 .(c)$ | $23 .(b)$ | $24 .(b)$ | $25 .(c)$ |
| 26.(d) | $27 .(c)$ | $28 .(c)$ | $30 .(c)$ |  |

## [PART-B : MULTIPLE SELECTIVE QUESTIONS (MSQ)]

| 31.(a),(b),(c),(d) | 32.(a),(b) | 33.(a),(c) | 34.(a),(c) | 35. (a),(c) |
| :--- | :--- | :--- | :--- | :--- |
| 36.(a),(c) | 37.(b),(c),(d) | 38.(a),(b),(c) | 39.(a),(d) | 40.(a),(b) |

## [PART-C : NUMERICAL ANSWER TYPE QUESTIONS (NAT)]

41.(0)
45.(4 to 4)
49.(0.26 to 0.28 )
53.(5)
57.(9)
42. (- 0.5)
46. (30)
50.(14)
54. (7.7 to 8.2)
58. (-0.5 to -0.5 )
43. (318 to 320)
44.(21)
48. $\left(41.81^{\circ}\right)$
52.(3.4 to 3.7)
56.(0.50 to 0.52)
60. (6.40 to 6.48 )

