## UNIVERSITY OF MYSORE Postgraduate Entrance Examination October-2022



## SUBJECT CODE :



QUESTION BOOKLET
(Read carefully the instructions given in the Question Booklet)


MAXIMUM MARKS : 50
MAXIMUM TIME : 75 MINUTES
(Including time for filling O.M.R. Answer sheet)

## INSTRUCTIONS TO THE CANDIDATES

1. The sealed question paper booklet containing 50 questions enclosed with O.M.R. Answer Sheet is given to you.
2. Verify whether the given question booklet is of the same subject which you have opted for examination.
3. Open the question paper seal carefully and take out the enclosed O.M.R. Answer Sheet outside the question booklet and fill up the general information in the O.M.R. Answer sheet. If you fail to fill up the details in the form as instructed, you will be personally responsible for consequences arising during evaluating your Answer Sheet.
4. During the examination:
a) Read each question carefully.
b) Determine the Most appropriate/correct answer from the four available choices given under each question.
c) Completely darken the relevant circle against the Question in the O.M.R. Answer Sheet. For example, in the question paper if "C" is correct answer for Question No.8, then darken against SI. No. 8 of O.M.R. Answer Sheet using Blue/Black Ball Point Pen as follows:

Question No. 8. (A) (B) (D) (Only example) (Use Ball Pen only)
5. Rough work should be done only on the blank space provided in the Question Booklet. Rough work should not be done on the O.M.R. Answer Sheet.
6. If more than one circle is darkened for a given question, such answer is treated as wrong and no mark will be given. See the example in the O.M.R. Sheet.
7. The candidate and the Room Supervisor should sign in the O.M.R. Sheet at the specified place.
8. Candidate should return the original O.M.R. Answer Sheet and the university copy to the Room Supervisor after the examination.
9. Candidate can carry the question booklet and the candidate copy of the O.M.R. Sheet.
10. The calculator, pager and mobile phone are not allowed inside the examination hall.
11. If a candidate is found committing malpractice, such a candidate shall not be considered for admission to the course and action against such candidate will be taken as per rules.
12. Candidates have to get qualified in the respective entrance examination by securing a minimum of 8 marks in case of SC/ST/Cat-I Candidates, 9 marks in case of OBC Candidates and 10 marks in case of other Candidates out of 50 marks.

## INSTRUCTIONS TO FILL UP THE O.M.R. SHEET

1. There is only one most appropriate/correct answer for each question.
2. For each question, only one circle must be darkened with BLUE or BLACK ball point pen only. Do not try to alter it.
3. Circle should be darkened completely so that the alphabet inside it is not visible.
4. Do not make any unnecessary marks on O.M.R. Sheet.
5. Mention the number of questions answered in the appropriate space provided in the O.M.R. sheet otherwise O.M.R. sheet will not be subjected for evaluation.

1) A ball whose kinetic energy is E , is thrown at an angle of $45^{\circ}$ with the horizontal direction. Its kinetic energy at the highest point of its trajectory will be
(A) $E$
(B) $\frac{E}{2}$
(C) $\frac{E}{\sqrt{2}}$
(D) 0
2) Three particles of the same mass lie in the $x-y$ plane. The ( $x, y$ ) coordinates of their positions are $(1,1),(2,2)$ and $(3,3)$ respectively. The $(x, y)$ coordinates of the center of mass are
(A) $(1,2)$
(B) $(2,2)$
(C) $(4,2)$
(D) $(6,6)$
3) A spaceship moving away from the earth with velocity 0.6 C fires a rocket in the direction of travel with a speed of 0.7 C relative to the spaceship. What will be the velocity of the rocket, as observed form the earth? Where C is the velocity of light
(A) 0.92 C
(B) 0.17 C
(C) -0.92 C
(D) -0.17 C
4) If the position.of the particle is described by the expression $x=a$ $(\sin 2 w t \hat{i}+\cos 2 w t \hat{j})$, the acceleration of the particle is
(A) $-2 w x$
(B) $4 w^{2} x$
(C) $-4 w^{2} x$
(D) $2 w x$
5) Maxwell-Boltzmann Law is applicable for the
(A) Distinguishable particles
(B) Indistinguishable particles
(C) Particles with half integral spin
(D) Particle with integral spin
6) Rocket works on the Newton's third law of motion and conservation of
(A) Energy
(B) Momentum
(C) Torque
(D) Work
7) Two particles of masses ' $m$ ' and ' 4 m ' have linear momentum in the ratio of $2: 1$. What is the ratio of their kinetic energies?
(A) 4
(B) 16
(C) 8
(D) 2
8) Two satellites $A$ and $B$ are orbiting around the earth in circular orbits of the same radius. The mass of A is 14 times that of B . The ratio of the period of revolution of $B$ to that of $A$ is
(A) $1: 14$
(B) $1: 8$
(C) $1: 6$
(D) $1: 1$
9) Kepler's laws of planetary motion replaced circular orbits with the
(A) Parabolic orbits
(B) Hyperbolic orbits
(C) Elliptical orbits
(D) Conical orbits
10) The fundamental particles of universe are
(A) Bosons and Leptons
(B) Leptons and Quarks
(C) Bosons and Quarks
(D) Mesons and Leptons
11) A round disc with a moment of inertia $I_{2}$ about its axis perpendicular to its plane and passing through its centre is placed over another disc with moment of inertia $I_{1}$ rotating with an angular velocity ' $\omega$ ' about the same axis. The magnitude of the final angular velocity of the combination of discs is
(A) $\frac{\mathrm{I}_{2} \omega}{\mathrm{I}_{1}+\mathrm{I}_{2}}$
(B) $\omega$
(C) $\frac{\mathrm{I}_{1} \omega}{\mathrm{I}_{2}+\mathrm{I}_{2}}$
(D) $\frac{\left(\mathrm{I}_{1}+\mathrm{I}_{2}\right) \omega}{\mathrm{I}_{1}}$
12) Rayleigh-Jean's law is an approximation of Planck's law at
(A) longer frequency region
(B) shorter frequency region
(C) intermediate frequency region
(D) all frequencies
13) A hot liquid is kept in a big room. The logarithm of the numerical value of temperature difference between the liquid and that of the room is plotted against time. The plot will be nearly
(A) parabola
(B) straight line
(C) ellipse
(D) circular arc
14) A body of mass 10 kg is attached to a wire 0.3 m long. Its breaking stress is $4.8 \times$ $10^{7} \mathrm{~N} / \mathrm{m}^{2}$. The area of cross section of the wire is $10^{-6} \mathrm{~m}^{2}$. What is the maximum angular velocity with which it can be rotated in the horizontal circle?
(A) $1 \mathrm{rad} / \mathrm{s}$
(B) $2 \mathrm{rad} / \mathrm{s}$
(C) $8 \mathrm{rad} / \mathrm{s}$
(D) $4 \mathrm{rad} / \mathrm{s}$
15) The conservation of angular momentum in the central force field motion leads to:
(A) Kepler's $1^{\text {st }}$ law
(B) Kepler's $2^{\text {nd }}$ law
(C) Newton's $1^{\text {st }}$ law
(D) Newton's $3^{\text {rd }}$ law
16) A liquid drop at temperature $T$, isolated from its surroundings, breaks into a number of droplets. The temperature of the droplets will be
(A) equal to T
(B) greater than T
(C) less than T
(D) none of the above
17) When the temperature is increased, the angle of contact of a liquid with the surface
(A) increases
(B) decreases
(C) remains the same
(D) first increases and then decreases
18) The first law of thermodynamics is a statement of
(A) Conservation of heat
(B) Conservation of work
(C) Conservation of momentum
(D) Conservation of energy
19) The entropy of an ideal gas increases by $400 \mathrm{JK}^{-1}$. When it undergoes an isothermal expansion at 500 K . The amount of heat absorbed by the gas is
(A) $2 \times 10^{5} \mathrm{~J}$
(B) 1.25 J
(C) 0.8 J
(D) 8 J
20) Oil spreads over water while water does not spread over oil. This is due to the property of
(A) elasticity
(B) viscosity
(C) surface tension
(D) friction
21) If $\mu_{0}$ and $\mu_{\mathrm{e}}$ are the crystal's refractive indices for O-ray and E-ray respectively. Which of the following relations is correct for the negative crystal?
(A) $\mu_{0}>\mu_{e}$
(B) $\mu_{0}<\mu_{e}$
(C) $\mu_{0} \leq \mu_{\text {e }}$
(D) $\mu_{0}=\mu_{e}$
22) The plane-polarized light of wavelength $6000 \AA$ is incident perpendicularly on a calcite plate of thickness 0.15 mm . Calculate the phase difference introduced between the E-ray and O-ray. (Given that $\mu_{0}=1.6$ and $\mu_{\mathrm{e}}=1.4$ )
(A) $\pi$
(B) $10 \pi$
(C) $100 \pi$
(D) $1000 \pi$
23) The dark lines constituting the absorption spectrum exhibited by sunlight are frequently called:
(A) Fermi lines
(B) Franklin lines
(C) Fresnel lines
(D) Fraunhofer lines
24) In Michelson's interferometer, 100 fringes cross the field view when the movable mirror is displaced through 0.02948 mm . Calculate the wavelength of monochromatic light used
(A) $5600 \AA$
(B) $5896 \AA$
(C) $4000 \AA$
(D) $4890 \AA$
25) When a monochromatic light ray enters from air $(\mathrm{n}=1)$ to glass prism $(\mathrm{n}=1.5)$, then the monochromatic light ray in the glass prism have
(A) the same frequency, but the wavelength is greater than in air.
(B) the same frequency, but the wavelength is smaller than in air.
(C) the same wavelength, but the frequency is greater than in air.
(D) the same wavelength, but the frequency is smaller than in air.
26) The differential form of Faraday's law of electromagnetic induction is
(A) $\vec{\nabla} \times \vec{E}=\frac{\partial \vec{B}}{\partial t}$
(B) $\vec{\nabla} \times \vec{B}=\mu_{0} \vec{J}$
(C) $\vec{\nabla} \times \vec{B}=\frac{\partial \vec{E}}{\partial t}$
(D) $\vec{\nabla} \times \vec{H}=\vec{J}+\frac{\partial \vec{D}}{\partial t}$
27) If the strength of the magnetic field at a point $\vec{r}$ near a long straight currentcarrying wire is $\vec{B}$. The value of the field at a distance $r / 2$ will be
(A) $\vec{B} / 2$
(B) $\vec{B} / 4$
(C) $2 \vec{B}$
(D) $4 \vec{B}$
28) Calculate the value of stored energy in an inductor if the value of inductance is 20 $H$ and $4 A$ of current flows through it
(A) 0 J
(B) 150 J
(C) 100 J
(D) 160 J
29) A thermocouple is used to measure
(A) Voltage
(B) High temperatures
(C) Potential difference
(D) Low temperatures
30) Under the condition of resonance in the LCR series circuit, the power factor of the circuit is
(A) 0.5 lagging
(B) 0.5 leading
(C) Unity
(D) Zero
31) "No two electrons in an isolated atom may have the same four quantum numbers" is
(A) Aufbau principle
(B) Hund's rule
(C) Pauli's exclusion principle
(D) Bohr's principle
32) The ratio of magnetic dipole moment to orbital angular momentum is called as
(A) Bohr magneton
(B) Lande's splitting factor
(C) Gyromagnetic ratio
(D) Larmor's ratio
33) Spin multiplicity of a state with $s=1 / 2$ is
(A) 0
(B) $1 / 2$
(C) 1
(D) 2
34) The splitting of spectral lines into two or three components in the presence of a strong magnetic field is known as
(A) Stark effect
(B) Normal Zeeman effect
(C) Anomalous Zeeman effect
(D) Paschen effect
35) The principle of LASER is
(A) induced absorption of radiation
(B) spontaneous emission of radiation
(C) stimulated emission of radiation
(D) stimulated absorption of radiation
36) The mean radius of an atomic nucleus is of the order of
(A) $10^{-14}$ to $10^{-15} \mathrm{~m}$
(B) $10^{-14}$ to $10^{-15} \AA$
(C) $10^{-14}$ to $10^{-15} \mathrm{fm}$
(D) $10^{-14}$ to $10^{-15} \mathrm{~cm}$
37) Nuclear forces are
(A) Charge dependent
(B) Charge independent
(C) Weak in nature
(D) Spin independent
38) Meson theory of nuclear forces was proposed by
(A) Rutherford
(B) Chadwick
(C) Yukawa
(D) Thomson
39) Liquid drop model explains
(A) The magic numbers
(B) Nuclear fission
(C) Spin of nuclei
(D) Magnetic moments of nuclei
40) Which of the following statement about the GM counter is false?
(A) It contains monoatomic inert gas
(B) It works in the continuous discharge region
(C) It can be used to measure the energy of the particle
(D) It is operated in the plateau region
41) The expression for an electrical conductivity of a metal in terms of mass of an electron (m), charge of an electron (e), concentration of electrons (n) and collision time $(\tau)$, according to classical free electron theory, is
(A) $n e^{2} \tau / m$
(B) $n e \tau / m$
(C) $2 \mathrm{ne} \tau / \mathrm{m}$
(D) $n e \tau^{2} / m$
42) The forbidden energy gap, between the conduction band and valence band, in a semiconductor is of the order of
(A) 1 MeV
(B) 0.1 MeV
(C) 1 eV
(D) 5 eV
43) The quantity which, according to the Wiedemann-Franz law, is directly proportional to the absolute temperature
(A) The ratio of thermal conductivity (k) to the electrical conductivity ( $\sigma$ )
(B) The ratio of mobility ( $\mu$ ) to the electrical conductivity ( $\sigma$ )
(C) The ratio of thermal conductivity ( k ) to the mobility ( $\mu$ )
(D) The ratio of electrical conductivity ( $\sigma$ ) to the thermal conductivity (k)
44) Einstein's theory concludes that, at low temperatures the specific heat
(A) Increases linearly with decrease of temperature
(B) Drops linearly with decrease of temperature
(C) Drops exponentially with decrease of temperature
(D) Remains constant
45) In an n-type semiconductor at low temperatures, the Fermi level
(A) Lies at the midpoint of energy gap
(B) Lies in the energy gap near to the bottom of conduction band
(C) Lies in the energy gap near to the top of valence band
(D) Lies in the conduction band
46) In the voltage regulator shown below, if the current through the load decreases,

(A) There will be an increase in current through R1
(B) The current through R 1 will decrease
(C) Zener diode current will decrease
(D) Zener diode current will increase
47) Internal resistance of a photodiode
(A) Increases with light intensity when reverse biased
(B) Decreases with light intensity when reverse biased
(C) Increases with light intensity when forward biased
(D) Decreases with light intensity when forward biased
48) An amplifier circuit of voltage gain 100 gives 10 V output, the value of input voltage is
(A) 10 V
(B) 100 mV
(C) 10 mV
(D) 1 mV
49) The Hartley oscillator's tank circuit consists of
(A) One capacitor and two inductors
(B) Two capacitor and two inductors
(C) One capacitor and three inductors
(D) Two capacitors and one inductor
50) Two NOT gates are connected at the two inputs of a NAND gate. This combination will behave like
(A) AND gate
(B) OR gate
(C) NOR gate
(D) NAND gate

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## Rough Work

## అభ్యథిรగษిగి శ్జอఒసేగఆు



 ఎంబదన్ను யరిరిలలిసిరి.



 జదాబ్దారరంగిరుత్తిర.


 అత్తృరహస్ను నిథణరి.


 కుంబిర:



6. ఒండు నిదిషష్ట్రు
 ळలళెయల్లిన లుదాळరణ నైలణి.
 యృడ్బొలు.
 పిల్టలిద్యానిలయుద
 ஹృఁగబळుదు.




 అంచగఆన్ను யֹడియత్ర్ప్దు.

## ఓ.ఎం.ఆరా. ळలఆయన్న్ కుంబలు స్యృజసెగఆు









Note : English version of the instructions is printed on the front cover of this booklet.

