## UNIVERSITY OF MYSORE Postgraduate Entrance Examination October-2021



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


MAXIMUM MARKS : 50
MAXIMUM TIME : 1.15 HOURS
(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) The radial and transverse velocity components are
(A) $\dot{\rho}$ and $\rho \dot{\phi}$
(B) $\rho$ and $\rho \dot{\phi}$
(C) $\dot{\rho}$ and $\rho \phi$
(D) $\dot{\rho}$ and $\dot{\rho} \dot{\phi}$
2) Centripetal force is
(A) Not a fundamental force
(B) Net force
(C) Both (A) and (B)
(D) Fundamental force
3) A coordinate system attached to the Earth is
(A) Not an inertial reference
(B) Inertial reference
(C) Accelerating frame of reference
(D) Both (A) and (C)
4) On Earth, an object that moves along a north-south path, will undergo apparent deflection to the
(A) Left in the Northern Hemisphere
(B) Right in the Northern Hemisphere
(C) Right in the southern Hemisphere
(D) Will not undergo apparent deflection
5) According to Doppler Shift,
(A) The speed of light does not change with relative velocity
(B) Frequency of light changes
(C) Wavelength of light changes
(D) All of the above
6) The phonons, photons and mesons obey
(A) F-D statistics
(B) M-B statistics
(C) B-E statistics
(D) Do not obey statistics
7) A rocket of mass 80 kg is set for a vertical firing. If the exhaust speed of the vapour is $800 \mathrm{~m} / \mathrm{sec}$, how much gas must be ejected per second to supply the thrust needed to overcome the weight of the rocket.
(A) $9.8 \mathrm{~kg} / \mathrm{s}$
(B) $98 \mathrm{~kg} / \mathrm{s}$
(C) $0.98 \mathrm{~kg} / \mathrm{s}$
(D) $10 \mathrm{~kg} / \mathrm{s}$
8) If a particle is projected from the surface of the earth with an initial kinetic energy equal to its initial potential energy (in magnitude) then the kinetic energy at infinity will be.
(A) Negative
(B) Imaginary
(C) Positive
(D) Zero
9) A sand bag of mass 10 kg is suspended with a 3 m long weightless string. A bullet of mass 200 g is fired with a speed $20 \mathrm{~m} / \mathrm{s}$ into the bag and stays in the bag. The speed acquired by the bag is
(A) $0.932 \mathrm{~m} / \mathrm{s}$
(B) $0.329 \mathrm{~m} / \mathrm{s}$
(C) $0.392 \mathrm{~m} / \mathrm{s}$
(D) $0.322 \mathrm{~m} / \mathrm{s}$
10) 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) $4 \mathrm{rad} / \mathrm{s}$
11) A circular thin disc of mass 5 kg has a radius 0.2 m . The moment of inertia about an axis passing through the edge and perpendicular to the plane of the disc (in $\mathrm{kgm}^{2}$ ) is
(A) 0.01
(B) 0.03
(C) 0.02
(D) 0.3
12) The relation between young's modulus, bulk modulus and poisson's ratio is
(A) $\mathrm{q}=3 \mathrm{k}(1-2 \sigma)$
(B) $\mathrm{q}=3 \mathrm{k}(1-\sigma)$
(C) $\mathrm{q}=3 \mathrm{k}(1+2 \sigma)$
(D) $\mathrm{q}=3 \mathrm{k}(1+\sigma)$
13) A U-tube containing a liquid moves with a horizontal acceleration ' $a$ ' along a direction joining the two vertical limbs. The separation between these limbs is ' $d$ '. The difference in their liquid levels is
(A) $\frac{a d}{g}$
(B) $\frac{2 a d}{g}$
(C) $\frac{a d}{2 g}$
(D) $d \tan \left(\frac{a}{g}\right)$
14) 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
15) 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
16) A Carnot engine operates between $327^{\circ} \mathrm{C}$ and $57^{\circ} \mathrm{C}$. What is its efficiency?
(A) $45 \%$
(B) $37 \%$
(C) $74 \%$
(D) $79 \%$
17) Five molecules have speeds of $12,16,32,40$ and $48 \mathrm{~m} / \mathrm{s}$. The root mean square speed of these molecules is
(A) $29.6 \mathrm{~m} / \mathrm{s}$
(B) $32.6 \mathrm{~m} / \mathrm{s}$
(C) $5.92 \mathrm{~m} / \mathrm{s}$
(D) $63 \mathrm{~m} / \mathrm{s}$
18) 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) a parabola
(B) a straight line
(C) an ellipse
(D) a circular arc
19) Rayleigh-Jeans law is an approximation of Planck's law at
(A) Shorter wavelength region
(B) Higher wavelength region
(C) Both regions
(D) Intermediate wavelength region
20) Newton's law of cooling is a special case of
(A) Wein's displacement law
(B) Kirchoff's law
(C) Stefan's law
(D) Planck's law
21) The Michelson interferometer employs a $\qquad$ scheme in light from an extended source.
(A) division of amplitude
(B) division of wavefront
(C) both division of amplitude and wavefront
(D) division of waves
22) When a plate of thickness 0.025 mm is placed in the path of a Michelson Interferometer, a shift of 50 fringes is observed for a light of wavelength $5000 \AA$. What is the refractive index of the plate?
(A) 1
(B) 1.5
(C) 2
(D) 2.5
23) A monochromatic light with a wavelength of 500 nm strikes a grating and produces the fourth-order bright line at an angle of $30^{\circ}$. The distance between slits is
(A) $4 \times 10^{-5} \mathrm{~m}$
(B) $5 \times 10^{-5} \mathrm{~m}$
(C) $4 \times 10^{-6} \mathrm{~m}$
(D) $5 \times 10^{-6} \mathrm{~m}$
24) In a uniaxial positive crystal relation between $v_{e}$ and $v_{o}$
I) $\mathrm{v}_{\mathrm{e}}<\mathrm{v}_{\mathrm{o}}$
II) $v_{e}>v_{o}$
III) $\mathrm{v}_{\mathrm{e}}=\mathrm{v}_{\mathrm{o}}$; along the optic axis
IV) $\mathrm{V}_{\mathrm{e}} \neq \mathrm{V}_{\mathrm{o}}$; along the optic axis

Which statements are true?
(A) I and III
(B) I and IV
(C) II and III
(D) II and IV
25) The image of tip of the needle is not sharp on the screen. This is due to
(A) Polarization
(B) Interference
(C) Refraction
(D) Diffraction
26) In an $L C R$ circuit inductance is changed from $L$ to $L / 2$. To keep the same resonance frequency, C should be changed to
(A) 2 C
(B) $\mathrm{C} / 2$
(C) 4 C
(D) $\mathrm{C} / 4$
27) The inductance of the coil is proportional to
(A) Average length of the coil
(B) Number of turns in the coil
(C) Square of area of the coil
(D) Square of number of turns in the coil
28) Refrigerators work on the principle of
(A) Seebeck effect
(B) Thomson effect
(C) Joule effect
(D) Peltier effect
29) Calculate the distance between two charges of 4 C forming a dipole, with a dipole moment of 6 units.
(A) 1
(B) 1.5
(C) 2
(D) 2.5
30) The gradient of a scalar gives a
(A) Scalar
(B) Vector
(C) Either scalar or vector
(D) Zero
31) Stern-Gerlach experiment confirms
(A) Space quantization of angular momentum of electron only
(B) Electron spin only
(C) Space quantization of angular momentum of electron and the electron spin
(D) Non existence of ether medium
32) Characteristics of Raman line is
(A) Anti-stokes lines are always more intense than stokes line
(B) Stokes lines are always more intense than anti stoke line
(C) Raman lines are asymmetrically displaced about the parent line
(D) Parent line is disappearing
33) A laser beam has a power of 100 m W and an aperture of $4 \times 10^{-3} \mathrm{~m}$. It emits light of wavelength $6000 \AA$. The beam is focused with a lens of focal length 0.1 m . Calculate the intensity of the image.
(A) $4.44 \times 10^{8} \mathrm{Wm}^{-2}$
(B) $2.46 \times 10^{12} \mathrm{Wm}^{-2}$
(C) $1.52 \times 10^{8} \mathrm{Wm}^{-2}$
(D) $9.02 \times 10^{16} \mathrm{Wm}^{-2}$
34) Calculate the wavelength associated with a proton moving with a velocity $10^{5} \mathrm{~ms}^{-1}$. Given $\mathrm{h}=6.6 \times 10^{-34} \mathrm{Js}$.
(A) $0.0395 \AA$
(B) $2.53 \AA$
(C) $0.53 \AA$
(D) $0.3952 \AA$
35) The ground state energy of a quantum harmonic oscillator is equal to
(A) $\hbar \omega$
(B) $\frac{1}{2} \hbar \omega$
(C) $\frac{3}{2} \hbar \omega$
(D) $2 \hbar \omega$
36) The binding energy of ${ }_{2}^{4} \mathrm{He}$ nucleus is
(A) 28.29 MeV
(B) 282.9 MeV
(C) 29 keV
(D) 2.8 MeV
37) The expression representing $\hat{a}^{+}$decay is
(A) ${ }_{Z}^{A} X \rightarrow{ }_{Z+1}^{A} Y+\beta^{+}+\bar{v}$
(B) ${ }_{Z}^{A} X \rightarrow{ }_{Z-1}^{A} Y+\beta^{+}+v$
(C) ${ }_{Z}^{A} X \rightarrow{ }_{Z-1}^{A} Y+\beta^{+}+\bar{v}$
(D) ${ }_{Z}^{A} X \rightarrow{ }_{Z-1}^{A} Y+\beta^{+}$
38) Which of the following are true with respect to GM counters?
(A) Used for charged particle detection as the GM tube efficiency is very high for charged particles.
(B) Not used to count neutrons because of low neutron capture cross section and hence low neutron counting efficiency.
(C) Gamma ray efficiency of GM tubes is less compared to beta ray efficiency.
(D) All the above.
39) The nuclear magic numbers are
(A) $4,8,16,32,50,82$ and 126
(B) $6,2,10,20,50,80$ and 124
(C) 2, 8, 20, 28, 50, 82 and 126
(D) 2, 8, 16, 32, 52, 82 and 126
40) The Q -value in the following fission reaction is of the order of
${ }_{92}^{235} U+{ }_{0}^{1} n \rightarrow{ }_{56}^{141} \mathrm{Ba}+{ }_{36}^{92} \mathrm{Kr}+3{ }_{0}^{1} n+Q$
(A) 200 MeV
(B) 200 keV
(C) 50 MeV
(D) 500 MeV
41) The exchange particle between the nucleons of a nucleus according to Yukawa is
(A) Proton
(B) Positron
(C) Photon
(D) Meson
42) Silicon has $Z=14$, its outermost orbit is
(A) Partially filled
(B) Half filled
(C) Completely occupied
(D) Empty
43) When germanium crystal is doped with phosphorus atoms, it becomes
(A) p - type semiconductor
(B) n - type semiconductor
(C) An insulator
(D) Photo- transistor
44) When electron leaves the N-type material to fill holes in the P-type material, the process is called
(A) Doping
(B) Mixing
(C) Depletion
(D) Diffusion
45) DC Load line of transistor circuit
(A) is a curved line
(B) has a negative slope
(C) gives graphic relationship between IC and IB
(D) does not contain the Q-point
46) The critical temperature of superconductors varies with the
(A) Debye temperature
(B) Critical field
(C) Isotopic mass
(D) None of the above
47) In a transistor Hartley oscillator
(A) No capacitor is used
(B) Untapped coil is used
(C) Inductive positive feedback is used
(D) Inductive negative feedback is used
48) AND gate
(A) implements logic addition
(B) is equivalent to a parallel switching circuit
(C) is an any-or-all gate
(D) is equivalent to a series switching circuit
49) Universal logic gates are
(A) NOT, AND, OR
(B) NOT, NAND, NOR
(C) NAND, NOR
(D) NOR, NAND, EX-OR
50) Neutron is discovered by
(A) Rutherford
(B) James Chadwick
(C) Merry Curie
(D) Niels Bohr

## $\ominus \ominus \ominus$

## 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.

