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2B2M19092 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Physics Degree Examination, March /April 2019

BPHY2B02 – Properties of matter, Waves and Acoustics

(2018 Admission onwards)

Time: 3 hours Max. Marks : 80

SECTION A

(Answer in a word or phrase)

Answer all questions; each question carries 1 mark

1. Limiting values of Poisson's ratio in elasticity are .....
2. SI unit of shearing stress is .....
3. What is the frequency of second overtone, if the fundamental frequency of vibration for a transverse wave is 'n' .....
4. Velocity of longitudinal wave in a gas depends upon elasticity and ..... of the medium
5. Sound waves are

   a)Transverse b)Electro magnetic

   c)Longitudinal d)none of the above
6. The velocity of transverse waves in a stretched string is given by .....
7. The Intensity of wave attenuates by 10% while passing through a block. If it pass through two blocks, the intensity of the wave will be attenuated to

   a)80% b) 89% c) 81% d)78%
8. For an undamped oscillator, the quality factor is .....
9. What fraction of total energy is kinetic when the displacement is half of the amplitude

   a)1/2 b) 1/8 c)1/4 d)3/4
10. When the amplitude of a particle executing SHM increases, the time period .....

(10 x 1 = 10 Marks)

SECTION B

(Answer in Two or Three sentences)
Answer all questions; each question carries 2 marks

11. What is the advantage of I form of Girders?
12. State the law connecting stress and strain.
13. Define anharmonic oscillator. Give one example.
14. Distinguish between group velocity and wave velocity.
15. State Fourier theorem.
16. What are the factors governing loudness of sound.
17. What is piezoelectric effect?

(7 x 2 = 14 Ma

SECTION C

(Answer in a paragraph of about half a page to one page)
Answer any five questions; each question carries 4 marks

18. Derive an expression for work done in twisting a cylindrical wire
19. What is quality factor? Discuss its importance.
20. Explain the Lissajous figures and give its applications
21. Derive the expression for the kinetic energy and potential energy of a simple harmonic oscillator.
22. Discuss the mode of transverse vibrations in strings.
23. Write a brief note on acoustics of buildings.
24. Explain the production of ultrasonic wave by piezoelectric crystal method.

(5 x 4 = 20 Mar

SECTION D

(Problems – formula and important steps)
Answer any four questions; each question carries 4 marks

25. A metal disc of 10 *cm* radius and 1 *kg* is suspended in a horizontal plane by a vertical wi attached to its centre. If the diameter of wire is 1 *mm*, its length 1 metre and period of oscillation is 4 seconds, find the rigidity of the wire.
26. A bar of length 75 *cm*, breadth 2 *cm*, and thickness 8 *mm* is fixed horizontally. When a load of 500 *gm* is suspended at the other end, it is depressed through 5 *mm*. Find the Young's modulus of the material of rod.

27. A simple harmonic motion is represented by $y = 10\sin(10\,t - \pi/6)$, where y in metres. t in seconds and phase angle in radians. Calculate the frequency, time period, and maximum velocity.
28. Calculate the percentage change in intensity when the intensity level is changed by 1 dB.
29. A source of sound has a frequency of 512 *Hz* and amplitude of 0.25 *cm*. What is the flow of energy across a cm^2/s, if the velocity of sound in air is 340 *m/s* and the density of air is 0.00129 gm/cm^3
30. Calculate the average energy stored in a 20 *gm* mass attached to a spring and vibrating with amplitude 1 *cm* in resonances with a periodic force whose frequency is 20 *Hz*. If the Q- factor of oscillator be 160, how much energy being dissipated per second?
31. A body having a mass of 4 *gm* executes SHM. The force acting on the body, when the displacement is 8 *cm*. is 24 *gm. wt.* Find the time period

(4 x 4 = 16 Marks)

SECTION E

(Essays - Answer in about two pages)

Answer any two questions; each question carries 10 marks

32. Describe an experiment with necessary theory to determine the modulus of elasticity of a given material using a cantilever.
33. Write the equation of motion of the forced harmonic oscillator. Derive an expression for the amplitude of forced oscillator and discuss the resonance.
34. Ste up the differential equation for a damped oscillator and discuss the over damping, critical damping and under damping.
35. What is meant by plane progressive waves? Show that the energy density is constituted by equal amounts of kinetic energy and potential energy.

(2 x 10 = 20 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March /April 2019

BPHY2C02 – Mechanic, Relativity, Waves and Oscillations

(2018 Admission onwards)

Time: 3 hours Max. Marks : 64

Part A

Answer *all* questions(Each question carries one mark)

1. The fictitious force experienced by a particle which is moving with respect to a rotating frame is called ----------
2. If the linear momentum of a body is increased by 50% its kinetic energy will increase by-----
3. Rockets and jet planes are working on the principle of ----------
4. For a conservative force F

   a)grad F = 0 b)Curl F = 0 c)div F = 0 d)grad(div F) = 0
5. Wave function has no direct ----------
6. At what velocity along its path will a rod contract by 25%
7. The unit of energy current is ----------
8. The variable in sound waves is ----------
9. The allowed values of energies of a particular system are called ----------
10. Resolving power of a Scanning Tunneling Microscope is of the order of ----------

(10 x1 =10 Marks)

Part B

Answer *all* questions(Each question carries two marks)

11. Explain coriolis force.
12. Explain the significance of mass – energy relation.
13. Why do we go for multi stage rockets? Explain.
14. Explain time dilation in relativity.
15. Explain Fourier theorem. Mention any one application.
16. Distinguish between energy density and energy current.
17. What are the admissibility conditions of wave function.

(7 x 2= 14 marks)

Part C

Answer *any three* questions(Each question carries four marks)

18. Draw and explain potential energy curve.
19. Prove that a moving clock always runs slower than a clock at rest.
20 Derive classical wave equation
21. Explain ether hypothesis.
22. Define central force. Show that angular momentum of a particle moving under centr force is conserved.

(3 x 4 = 12 Ma

Part D

Answer *any three* questions(Each question carries four marks)

23. Find the horizontal component of coriolis force acting on a body of mass 0.1 Kg mo northward with a horizontal velocity of 100m/s at 30^0 N latitude on the earth.
24. A clock gives correct time .With what speed should it be moved relative to an observ that it may seem to lose five minutes in 24 hours.
25. A body at rest explodes, breaking into three pieces, two pieces having equal masses f off perpendicular to one another with same speed of 30 m/s. The third piece has thre times mass of each other pieces. Find out velocity of third piece.
26. Plane harmonic waves of frequency 500Hz are produced in air with displacement amplitude 1×10^{-5}m. Calculate pressure amplitude,energy density, and energy flux in wave
27. A particle of mass 0.1 Kg experiences only a damping force proportional to its velocit If its velocity is reduced from 1m/s to 0.1m/s in 23 seconds , calculate relaxation time and the damping force when its velocity is 0.5m/s.

(3 x 4 = 12 Mar

Part E

Answer *any two* questions(Each question carries eight marks)

28. Arrive at the Lorentz transformation equations in accordance with the special theory o relativity.
29. Explain damped harmonic oscillator. Discuss in detail the cases of under damped and over damped oscillations.
30. Derive an expression for pressure variation, when a plane progressive longitudinal wav passes through a gaseous medium.
31. Derive the time dependent Schrodinger equation of matter waves. Give the physical intrepretation of wave function.

(2 x 8=16 Mark