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B2M20093 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March/April 2020

BPH2B02 –Mechanics

(2019 Admission onwards)

Time: 2 hours Max. Marks : 60

The symbols used in this question papers have their usual meanings

Section A- Short Answer Type

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)

What is a fictitious force? What is its expression for a freely falling object?

What is the principle of equivalence? What is the ratio of the gravitational mass to the inertial mass according to the principle of equivalence?

A Foucault pendulum has a time period of 12 Hours at a location. What is the latitude of this location?

State three Kepler's laws of planetary motion.

Evaluate the average value of $\cos^2\theta$ over a complete cycle.

Give two advantages and disadvantages of resonance.

Starting from the law of conservation of angular momentum derive the relation connecting the eccentricity, velocity at apogee and velocity at perigee of a planet.

The general solution of a simple harmonic motion can be written either as

$x(t) = A\cos(\omega_o t+\phi)$ or $x(t) = B\,\mathrm{Sin}(\omega_o t) + C\cos(\omega_o t)$, where A, B, C and ϕ are constants depending upon the initial conditions. What are the relations connecting A, B, C and ϕ?

Write down the expressions for the velocity and acceleration of a particle executing simple harmonic motion as a function of position. Given that the displacement $x = A\cos(\omega_o t)$.

. What is the general expression for the impedance of a medium for wave propagation? What is the impedance of free space for electromagnetic waves propagation?

. What is the correction by Laplace to the Newton's formula for the velocity of sound in air?

. If F(t) is a periodic function with period T, write down Fourier theorem and write the expressions for the coefficients.

(Ceiling-20)

Section B- Paragraph/ Problem Type

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. Show that shape of the water surface in a rotating bucket is a parabola. Get the expression for this parabola.
14. Draw the variation of U_{eff} with separation r in the energy diagram. Show the various cases of planetary orbits with different total energies.
15. Derive the dispersion relation for a transverse waves on a beaded string under tension T_o, bead mass m and separation between the beads a.
16. A musician's tuning fork rings at 440Hz. The intensity of the sound produced decreases to one fifth of its original intensity in 4 s. What is the Q factor of the tuning fork?
17. For a linear array of coupled pendulum with length 'l 'with spacing 'a', the dispersion relation is given by $\omega^2 = \frac{g}{l} + \frac{4K}{M}\sin^2(\frac{1}{2}ka)$. What is the minimum and maximum frequency range that can be sustained in the system?
18. The dispersion relation for electromagnetic wave in ionosphere is $\omega^2 = \omega_p^2 + c^2k^2$. Show that the phase velocity is greater than c and the group velocity is less than c.
19. Calculate the deflection of a stone dropped from a height of 50m at the equator due to Corioli force.

(Ceiling- 30

Section C- Essay Type

(Answer any one question. Answer carries 10 marks)

20. Reduce the two body central force problem to a one body problem and get the differentia connecting the separation r and θ that describes the trajectory of the planets.

    (i.e., Derive $\frac{dr}{dt}$ and $\frac{d\theta}{dt}$ and then $\frac{d\theta}{dr}$ in terms of r, angular momentum l, reduced mass μ total energy E and effective potential U_{eff}.)
21. Describe the equation of a damped harmonic oscillator. Assuming the solution of th displacement, explain the time dependence of amplitude and energy of oscillation and the factor.

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1B2M20092 (Pages :2) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March/April 2020

BPH2C02 – Optics , Laser, Electronics & Communication

(2019 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A

Answer all questions. Answer in two or three sentences. Each question carries a maximum oftwo marks.

1. Give the conditions to produce interference pattern by light
2. Give two difference between positive and negative crystal
3. State and explain grating law.
4. Distinguish between Fraunfoffer and Fresnel's diffraction.
5. State and explain Brewster's law.
6. Why grating spectrum is called a normal spectrum.
7. Obtain the relation between current amplification factors a and b
8. State De-Morgan's theorem.
9. What are the merits of a feedback circuit?
10. What is population inversion?
11. How an elliptically polarised light can be produced?
12. What is optical activity?

(Ceiling 20 marks)

Section B (Paragraph/Problem)

(Answer all questions. Each question carries a maximum offive marks. Answer in a paragraph.)

13. Explain the formation of colours in thin films.
14. What is the longest wavelength incidentnormally, that can be observed in the second order spectrum of a grating with 6000 lines/cm.
15. Calculate the least thickness of a polariser which would convert plane polarised light to circularly polarised light of wavelength 600 nm. Given μ_o=1.769 and μ_e=1.762
16. Draw the intensity distribution curve of a single slit diffraction pattern.Also write the expression for intensity distribution
17. Write a short note on He-Ne laser
18. What is meant by the resolving power of a grating. Write down the expression
19. Explain the working of a transistor amplifier.

(Ceiling 30 marks)

Section C(Essay)

Answer any One in about two pages.Each question carries ten marks

20. Describe the principle and working of a bridge rectifier. Derive the expression for efficiency and ripple factor.

21. What are Newton's Rings? Describe an experiment to determine the wavelength of a monochromatic light.

(1x10=10 Marks)