Benha University
1st Term Exam (January 2018) Final Exam
Class: 1st Year Students (تخلفات)
Subject: Physics (I)

Faculty of computer & informatics
Date: 28/12/2018
Time: 3 Hs.
Examiners: Dr. Salah Hamza

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ورقة كاملة

Q) Choose the correct answer and shaded its circle in the answer sheet: [115 marks]
Note: Select one answer only - don't use corrector - don't choose more than one answer.

Q1) Answer the following questions

The answer in red color

1. The dimensions of the velocity is, υ, is given by: (a) LT^{-1}, (b) $L^{-1}T^{-2}$, (c) $L^{2}T^{-2}$

2. Young's modulus of elasticity is given by: (a) $\frac{F_{\perp}\,\ell}{A\,\Delta\ell}$ (b) $\frac{F_{||}}{A\ \theta}$ (c) $-\frac{P\,V}{\Delta V}$

3. For an object performing simple harmonic motion, the maximum velocity is given by: (a) A, (b) ωA, (c) $\omega^2 A$

4. We can classify waves according to the motion of particles into: (a) Transverse, (b) plane, (c) Spherical

5. Chose the correct answer: (a) $x = \upsilon_o + \frac{1}{2}at^2$, (b) $\Delta x = \upsilon_o + at$, (c) $\Delta x = \frac{1}{2}(\upsilon_o + \upsilon)t$

6. The ratio of change in length to original length is defined as: (a) Volume strain (b) Longitudinal strain (c)Tangent strain.

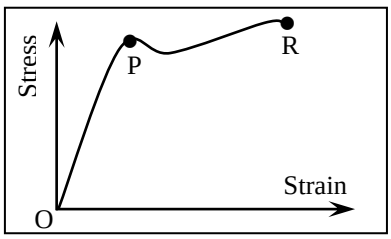
7. Point P is known as: (a) Breaking point, (b) Elastic limit, (c) Plastic limit

8. Point R is known as: (a) Breaking point, (b) Elastic limit, (c) Plastic limit

9. In OP range: (a) $\text{Stress} = \text{Strain}$, (b) $\text{Strain} \propto \text{Stress}$, (c) $\text{Stress} \propto \text{Strain}$

10. In OP range, the behavior is, (a) Plastic (b) Elastic, (c) no answer

11. Hooke's law is valid in the range: (a) OP, (b) PR, (c) no one



12. For an object performing simple harmonic motion, the maximum velocity is given by: (a) A, (b) ωA, (c) $\omega^2 A$

13. The main equation of simple harmonic motion is: (a) $\ddot{X} = -\omega^2 X$, (b) $X = -\omega^2 \ddot{X}$, (c) $\ddot{X} = \omega^2 X$

14. The work done per unit volume in stretching an elastic wire is given by:

(a) $\frac{1}{2} \times \text{Stress} \times \text{Strain}$, (b) $\text{Stress} \times \text{Strain}$, (c) $\frac{1}{4} \times \text{Stress} \times \text{Strain}$

15. Poison's ratio is given by: (a) $\frac{-dr/\ell}{d\ell/r}$, (b) $\frac{-\ell\,dr}{r\,d\ell}$, (c) $\frac{-d\ell/\ell}{dr/r}$

Q2) Using the dimensional analysis, derive an expression for the time period of oscillation of a simple pendulum. Assume that the time period depends on (i) mass, (ii) length and (iii) acceleration due to gravity

---------- **Solution** ----------

Assume that t, m, ℓ and g are related through the equation:

$$t \propto m^x \ell^y g^z$$

$$t = k\, m^x \ell^y g^z$$

By using the dimensional method

$$T = M^x L^y (L T^{-2})^z$$

$$M^0\ L^0\ T^1 = M^x\ L^{y+z}\ T^{-2z}$$

Comparison the powers of M, L and T on both sides

$$x = 0, \quad y + z = 0, \quad -2z = 1$$

Solving the three equations,

$$x = 0, \quad y = \tfrac{1}{2}, \quad z = -\tfrac{1}{2}$$

$$\therefore\ t = k\sqrt{\frac{\ell}{g}}$$

Q3) Prove that the relation between the linear velocity υ, angular frequency ω and wave number k is $\omega = k\upsilon$.

---------- Solution ----------

Since

$$2\pi = \omega T$$

and

$$2\pi = k\lambda$$

So

$$\omega T = k\lambda$$

Or

$$\omega = k\lambda * \frac{1}{T}$$

But

$$\nu = \frac{1}{T}$$

So

$$\omega = k\lambda\nu$$

By using the relation

$$\lambda\nu = \upsilon$$

We get

$$\omega = k\upsilon$$

With our best wishes

Prof. Dr. Salah Hamza