

Seat No. [REDACTED]Enrolment No. 102CTBM [REDACTED]

NATIONAL FORENSIC SCIENCES UNIVERSITY

B.Tech. – M.Tech. Computer science & Engineering (Cyber Security)

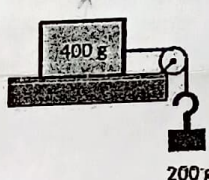
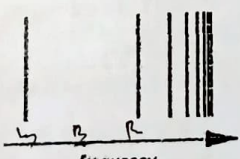
Subject Code: CTBTCSE S1 P1
 Subject Name: Engineering Physics
 Time: 3 Hours

Date: 14/03/2022

Total Marks: 100

Instructions:

1. Write down each question on separate page.
2. Attempt all questions.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks.

			Marks
Q.1	(a)	State laws of static friction.	02
	(b)	<p>A 400 g package lying on a horizontal surface is attached to a horizontal string which passes over a smooth pulley as shown in the diagram. When a mass of 200g is attached to the other end of the string, the package is on the point of moving. Find the coefficient of friction (μ).</p> <p>$\mu = \frac{F}{N}$ $\mu = \frac{200 \times 10}{400 \times 10} = \frac{1}{2} = 0.5$</p> 	03
	(c)	<p>Explain the effect of (i) density, (ii) pressure, (iii) temperature and (iv) humidity on velocity of sound in a medium.</p> <p style="text-align: center;">OR</p> <p>(i) The critical angle of a medium with respect to air is 45°. The refractive index of medium is? (ii) State Brewster's Law.</p>	04
	(d)	<p>This diagram shows the pattern of lines in the Lyman series of the atomic hydrogen spectrum.</p>  <p>(i) Which part of the electromagnetic spectrum (UV, visible or IR) is the Lyman series found in?</p> <p>(ii) Why does the series consist of a number of individual lines rather than a continuous spectrum?</p> <p>(iii) Which of the lines in the Lyman series has the lowest energy of light? Explain your answer.</p>	04

$$- \frac{13.6}{n^2}$$

$$\frac{40 \times 1.5}{200} = \frac{60}{100}$$

$$60 \times 1 = 60 \text{ m/s} \rightarrow$$

$$40 \times 1.5 = 60 \text{ m/s} \leftarrow$$

$$m_1 v_1 = m_2 v_2$$

$$60 \times 1 = 60 \times 1.5 \text{ m/s}$$

$$60 = -60 \rightarrow 0$$

	(e)	Aman weighs 60 kg and travels with velocity 1.0 ms^{-1} towards, Manoj who weighs 40 kg, and is moving with 1.5 ms^{-1} towards Aman. Calculate their momenta.	04
⇒	(f)	Differentiate between transverse and longitudinal waves.	03
Q.2	(a)	Draw a well labelled ray diagram of compound microscope. Give the characteristics of the final image formed.	05
	(b)	Emission of β -rays in radioactive decay results in the change of either mass or charge. Is this statement true or false?	01
	(c)	(i) State the necessary properties of the medium for wave propagation. (ii) Explain Chromatic aberration for spherical lenses. State a method to minimize or eliminate it.	04
		OR	
	(c)	Mention any four properties of Electromagnetic Waves	
	(d)	A particle is projected from the surface of the earth with a speed of 20 ms^{-1} at an angle 30° with the horizontal. Determine the (i) time of flight, (ii) range, (iii) maximum height, and (iv) equation of the trajectory for the projectile motion (Take $g = 10 \text{ ms}^{-2}$).	05
	(e)	(i) State three limitations of Rutherford's atomic model. (ii) Give necessary conditions for Total Internal Reflection.	03 02
Q.3	(a)	(i) Name any two necessary properties of the medium needed for wave propagation. (ii) Name the series of hydrogen spectrum which falls under ultra-violet region. (iii) State two merits of Bohr's model.	02 01 02
	(b)	(i) A motorcyclist rides in a vertical circle in a hollow sphere of radius 12.8 m. Find the minimum speed required so that he does not lose contact with the sphere at the highest point. (ii) Can centripetal acceleration change the speed of circular motion? Explain.	02 02
	(c)	(i) Differentiate between circular and elliptical polarization. (ii) What is the advantage of a diffraction grating over a double slit in dispersing light into a spectrum?	04

$$\frac{200 \times 40 \times 1.5}{10} = \frac{200 \times 60}{10}$$

$$\frac{200 \times 8100}{g}$$

$$\frac{2 \times 20 \times \frac{1}{2}}{10}$$

$$\frac{40 \times \frac{1}{2}}{10} = \frac{20 \times 2}{10}$$

$$\frac{2h}{a} = \frac{2h}{g}$$

$$2h = g \cdot v$$

$$= 10 \times 20$$

$$2h = 200$$

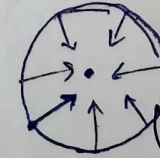
$$h = 100 \text{ m}$$

$$\text{Page} = \frac{200 \times 8100}{g}$$

$$\Rightarrow \frac{2 \times 200 \times \frac{5}{2} \times \frac{1}{2}}{10} \Rightarrow \frac{40 \times \frac{5}{2} \times \frac{1}{2}}{10}$$

$$\frac{12.8 \text{ v.}}{2}$$

$$6.4 \text{ OR}$$



$$(\alpha - \alpha(\theta)) + \alpha - \beta$$

$$gR = \frac{v^2}{r}$$

$$P = mv$$

$$= 60 \times 1 = 60$$

$$P_2 = 60 \times 1.5 \Rightarrow -60$$

$$\frac{12.8}{10.24}$$

$$\frac{128}{163.84}$$

$$\frac{A}{2P} \rightarrow \frac{A}{21D}$$

04
01
01
01

02
02

The diagram illustrates the penetration of alpha particles. A Radium source emits alpha particles through a slit. The particles are stopped by a 2mm thick Aluminium barrier. A 2cm thick Lead barrier is also shown.

$$\frac{10(11.7)^2}{8000}$$

$$\begin{array}{r} 05 \\ \cdot 1 \\ 800 \overline{) 12310} \\ \underline{800} \\ 4310 \\ \underline{400} \\ 310 \\ \underline{300} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

04
Q
03

01

$$\frac{mv^2}{h}$$

Speed = $\frac{d}{t}$

11.2 m/s $s = \frac{80m}{72m} = 1$

1.121 km/s $\frac{800}{72}$

		(ii) State law of conservation of linear momentum. A bullet of 5 g is fired from a pistol of 1.5 kg. If the recoil velocity of pistol is 1.5 m/s, find the velocity of bullet.	03
Q.5	(a)	Two radioactive materials A and B have decay constants 10λ and λ , respectively. If initially, they have the same number of nuclei, then after how much time will the ratio of the number of nuclei of A to that of B will be $1/e$.	04
	(b)	<p>(i) Define background radiations and identify its sources</p> <p>(ii) What do you mean by loudness of a sound? In what units is it measured? With the help of wave diagram, explain the difference between soft sound and loud sound.</p> <p style="text-align: center;">OR</p> <p>Derive expression of radius, velocity and energy of electron orbiting in any n^{th} orbit of Hydrogen atom.</p>	07
	(c)	<p>(i) Why is nuclear power not commonly used?</p> <p>(ii) Write main components of nuclear reactor and their function.</p>	01 04
	(d)	<p>(i) Can a sound wave in air be polarized? Explain.</p> <p>(ii) A body of mass 80 kg moving in a straight line on horizontal smooth surface. Its velocity decreases from 10 m/s to 2 m/s in 8 seconds. Find the force acting on this body. How much distance it would travel during this time interval?</p>	01 03

$$\begin{array}{r}
 0.693 \times 10 \\
 6.93 \\
 100 \overline{) 1693} \\
 \underline{600} \\
 930 \\
 \underline{900} \\
 30 \\
 \underline{20} \\
 10
 \end{array}$$

END OF PAPER

$$\begin{array}{r}
 0.690 \\
 10 \overline{) 0.693} \\
 \underline{60} \\
 93 \\
 \underline{90} \\
 30 \\
 \underline{20} \\
 10
 \end{array}$$

$$m = 80 \text{ kg}$$

$$v = 10 \text{ m/s} \rightarrow 2 \text{ m/s in 8 s.}$$

$$\lambda = v \cos \theta$$

$$\lambda = v \cos 30^\circ$$

$$10.2$$

$$\begin{array}{r}
 1.8 \\
 \times 8 \\
 \hline
 7.5
 \end{array}$$

4

$$v = u + at$$