FACULTY RECRUITMENT TEST
CATEGORY-A
JEE Main/JEE Advanced & IO
PHYSICS
PAPER A

Time: 1 Hour **Maximum Marks: 40**

Name:.....	Marks:
Subject:…….....	

Instructions

* Attempt all questions.
* Paper 1 has Two Parts **I and II**. Each question of **Part I carries 2 marks** and each question of **part II caries 5 marks.**
* Calculators and log tables are ***not permitted.***

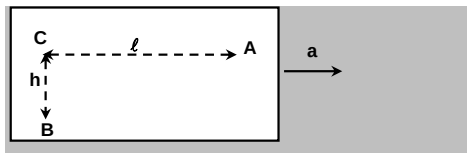
PART – I

1. Find the ratio between the normal and tangential acceleration of a point on the rim of a rotating wheel when at the moment when the vector of the total acceleration of this point forms an angle of 30° with the vector of the linear velocity.

2. A motor cyclist, going due east with a velocity of 10 m/s, finds that the wind is blowing directly from the north. When he doubles his speed, he finds that the wind is blowing from north east. In what direction and with what velocity is the wind blowing?.

3. A given object takes n times as much time to slide down a 45° rough inclined plane as it takes to slide down a perfectly smooth 45° inclined plane. Find the coefficient of Kinetic friction between the object and the inclined plane.

4. A seated tank containing a liquid of density moves with a horizontal acceleration ‘a’ as shown in the figure. Find the difference in pressure between the points A and B.



5. A cubical block of wood is floating in a liquid. If the ratio of the densities of the block and of the liquid is S, find the minimum weight of a body that should be kept on the block to just immerse it.

6. A 50gm lead bullet (sp. heat 0.020 cal/g) is initially at 30^0C. It is fired vertically upward with a speed 840 m/s. On returning to the starting level, it strikes a slab of ice at 0^0C. How much ice is melted? Assume no loss of heat. Latent heat of ice 80 cal / gm.

7. A body initially at 80^0 C cools to 64^0C in 5 minutes and 52^0C in 10 minutes. What will be its temperature after 15 minutes and what is the temperature of the surroundings?

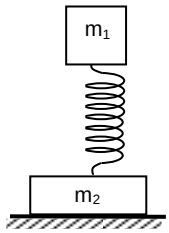
8. If pressure of a gas increases by 1 atmosphere and temperature increases by 1^0C, calculate the increment in the velocity of sound.

9. An X-ray tube operates at 5KV. Find the maximum speed of the electrons striking the target. Given: Mass of electron m = 9.1×10^{-31} Kg, charge on electron, e = 1.602×10^{-19} C.

10. A thin prism P_1 with angle 4^o and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. What is the angle of the prism P_2?

PART – II

11. Two blocks of masses m_1, and m_2 connected by a light spring of stiffness k, are kept on a smooth horizontal surface as shown in the figure. What should be the initial compression of the spring so that the system will be about to break off the surface, after releasing the block m_1?



12. A source emitting sound of frequency 180 Hz is placed infront of a wall at a distance of 2m from it. A detector is also placed in front of the wall at the same distance from it. Find the minimum distance between the source and the detector for which the detector detects a maximum of sound. Speed of sound air = 360 m/s.

13. Light is incident at an angle θ on one plane end of a transparent cylindrical rod of R.I n. Determine the least value of n so that the light entering the rod does not come out of the curved surface of the rod irrespective of the value of θ

14. The maximum kinetic energy of photoelectrons emitted from a metallic surface is 30 eV when monochromatic radiation of wavelength λ falls on it. When the same surface is illuminated with light of wavelength 2λ, the maximum kinetic energy photo electrons is observed to be 10 eV. Calculate the wavelength λ and determine the maximum wavelength of incident radiation for which photoelectrons can be emitted by this surface, (h = 6.62×10^{-34} J-S = 4.14×10^{-15} eV-s, c = 3×10^8 m/s)