Dear student following is a Moderate level [○ ○ ● ○ ○] test paper. Score of 15 Marks in 10 Minutes would be a satisfactory performance. Questions 1-10 (+3, –1). (All Questions have Single Options correct)

Q.1 According to Newton's first law of motion.....

(A) If the Sun disappeared, the Earth would orbit exactly how it is now

(B) If the Sun disappeared, the Earth would suddenly spiral in to the space occupied by the Sun.

(C) If the sun disappeared, the Earth would move in a straight line with the velocity that it had until it interacts with something else

(D) None of the above

Q.2 A sports car with mass 1000 kg can accelerate from rest to 27 m/s in 7.0 s. What is the average net force on the car?

(A) 3.9×10^3 N (B) 4.8×10^2 N

(C) 7.9×10^2 N (D) 1.7×10^3 N

Q.3 A net force of 10 newtons accelerates an object at 5.0 metres per second^2. What net force would be required to accelerate the same object at 1.0 metre per second^2?

(A) 1.0 N (B) 2.0 N

(C) 5.0 N (D) 50 N

Q.4 A spring scale reads. 20 Newtons as it pulls a 5.0 kilogram mass across a table. What is the magnitude of the force exerted by the mass on the spring scale ?

(A) 49.0 N (B) 20.0 N

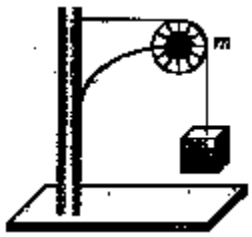
(C) 5.0 N (D) 4.0 N

Q.5 A net force F accelerates a mass m with an acceleration a. If the net force is applied to mass m/2, then the magnitude of the acceleration will be

(A) a/4 (B) a/2

(C) a (D) 2a

Q.6 A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given by



(A) $\sqrt{2}$ Mg (B) $\sqrt{2}$ mg

(C) $g\sqrt{(M+m)^2+m^2}$ (D) $g\sqrt{(M+m)^2+M^2}$

Q.7 A uniform metal chain is placed on a rough table such that one end of chain hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then, the coefficient of static friction is

(A) 3/4 (B) 1/4 (C) 2/3 (D) 1/2

Q.8 The maximum speed that can be achieved without skidding by a car on a circular unbanked road of radius R and coefficient of static friction μ, is

(A) μRg (B) $Rg\sqrt{\mu}$ (C) $\mu\sqrt{Rg}$ (D) $\sqrt{\mu Rg}$

Q.9 A uniform rope of length ℓ lies on a table. If the coefficient of friction is μ, then the maximum length ℓ_1 of the part of this rope which can overhang from the edge of the table without sliding down is

(A) $\frac{\ell}{\mu}$ (B) $\frac{\ell}{\mu+\ell}$ (C) $\frac{\mu\ell}{1+\mu}$ (D) $\frac{\mu\ell}{\mu-1}$

Q.10 If μ_s, μ_k and μ_r are coefficients of static friction, sliding friction and rolling friction, then

(A) $\mu_s < \mu_k < \mu_r$ (B) $\mu_k < \mu_r < \mu_s$

(C) $\mu_r < \mu_k < \mu_s$ (D) $\mu_r = \mu_k = \mu_s$

PHYSICS IIT JEE (JULY 1st WEEK CLASS TEST 4) (NLM) ANSWER KEY

Name : ..... **Roll No. :** .....

	A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	4	○	○	○	○	7	○	○	○	○
2	○	○	○	○	5	○	○	○	○	8	○	○	○	○
3	○	○	○	○	6	○	○	○	○	9	○	○	○	○
										10	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	A	B	B	D	D	D	D	C	C

SOLUTIONS

Sol.1 (C)

Sol.2 (A)

$$a_{av} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{27 - 0}{7.0 - 0} = \frac{27}{7}\ m/s^2,$$

$$F_{av} = a_{av} M = 1000 \times \frac{27}{7} N = 3.9 \times 10^3 N$$

Sol.3 (B)

Use the equation m = F/a (F = ma) to calculate the mass of the object,
then use F = ma to find the force.

$F = 2kg \times 1\ m/s^2 = 2N$

Sol.4 (B)

Action/reaction forces are equal so the magnitude of the force exerted by the mass on the spring scale will be 20 N.

Sol.5 (D)

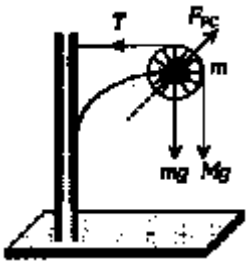
$$F = ma$$

or $$a = \frac{F}{m}$$

$$F = m'a' = \frac{m}{2} a'$$

or $$a' = \frac{2F}{m} = 2a$$

Sol.6 (D)



Force on the pulley by the clamp

$$F_{pc} = \sqrt{T^2 + [(M+m)\ g]^2}$$

$$F_{pc} = \sqrt{(Mg)^2 + [(M+m)\ g]^2}$$

$$F_{pc} = g\sqrt{M^2 + (M+m)^2}$$

Sol.7 (D)

$$\mu_s = \frac{\text{Length of the chain hanging from the table}}{\text{Length of the chain lying on the table}}$$

$$= \frac{\frac{\ell}{3}}{1 - \frac{\ell}{3}} = \frac{\ell/3}{2\ell/3} = \frac{1}{2}$$

Sol.8 (D)

In the given condition the required centripetal force is provided by frictional force between the road and tyres.

$$\frac{mv^2}{R} = \mu mg$$

$$\therefore \quad v = \sqrt{\mu Rg}$$

Sol.9 (C)

For given condition we can apply direct formula

$$\ell_1 = \left(\frac{\mu}{\mu + 1}\right)\ell$$

Sol.10 (C)