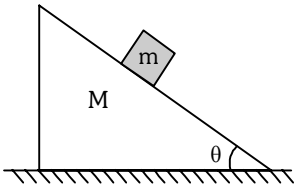
CLASS TEST

SECTION-I

Single Correct Answer Type **7 Q. [Marks 3 (–1)]**

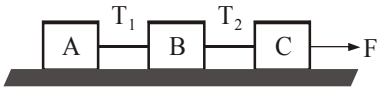
1. A block of mass m slides down on a wedge of mass M as shown in figure. Let $\vec{a}_1$ be the acceleration of the wedge and $\vec{a}_2$ the acceleration of block w.r.t. ground. N_1 is the normal reaction between block and wedge and N_2 the normal reaction between wedge and ground. Friction is absent everywhere. Select the incorrect alternative



(A) $N_2 < (M + m)g$ (B) $N_1 = m(g\cos\theta - |\vec{a}_1|\sin\theta)$

(C) $N_1 \sin\theta = M|\vec{a}_1|$ (D) $m\vec{a}_2 = -M\,\vec{a}_1$

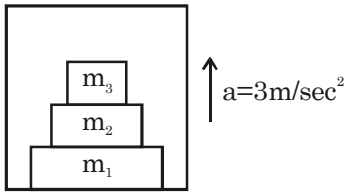
2. Three blocks are connected by strings and pulled by a force F = 60 N as shown in figure. If m_A = 10 kg, m_B = 20 kg and m_C = 30 kg, then



(A) Acceleration of the system is 2 m/s^2 (B) Acceleration of the system is 5 m/s^2

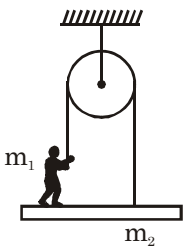
(C) T_1 = 10 N & T_2 = 30 N (D) T_1 = 20 N & T_2 = 40 N

3. A lift is moving with acceleration 3 m/sec^2. Three masses are put as shown in figure. Find the normal contact force exerted by floor of lift on mass m_1. (m_1 = 5kg, m_2 = 3kg and m_3 = 1 kg)



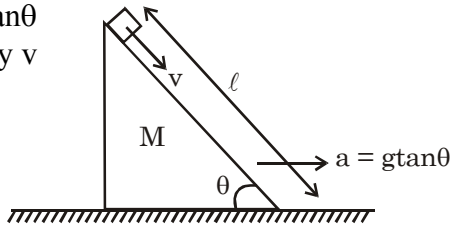
(A) 116 N (B) 117 N (C) 52 N (D) 13 N

4. A man of mass m_1 holding one end of a massless inextensible string that passes over the smooth pulley, is accelerating up while standing on a platform of mass m_2. Find the force applied by the man on the platform, if it moves up with an upward acceleration 'a'.



(A) $m_1 g$ (B) $m_1(g + a)$ (C) $\frac{(m_1 - m_2)}{2}g$ (D) $\frac{m_1 - m_2}{2}(g + a)$

5. A smooth wedge of mass M is pushed with an acceleration a = g tanθ and a block of mass m is projected down the slant with a velocity v relative to the wedge. The most **CORRECT** statement is :



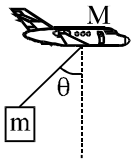
(A) The time taken by the block to reach the ground is $\frac{\ell}{v}$.

(B) The normal reaction between wedge and block is mgsecθ.

(C) The normal reaction offered by ground to the wedge is (M + m)g.

(D) All of the above.

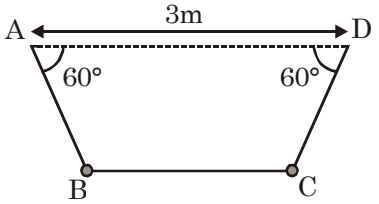
6. A helicopter of mass M is carrying a box of mass m at the end of a rope and is moving horizontally with constant acceleration 'a'. The acceleration due to gravity is 'g'. Neglect air resistance. The rope is stretched out from the helicopter at a constant angle θ to the vertical. What is this angle?



(A) sinθ = a/g (B) cosθ = a/g

(C) tanθ = a/g (D) sinθ = ma/(Mg)

7. ABCD is an elastic string of natural length 3 m and particles of equal mass are attached to the unstretched string at points B and C where AB = BC = CD. The ends A and D are then attached to two points on the same horizontal level and 3 m apart. The particles hang in equilibrium so that the string sections AB and CD are each at 60° to the horizontal. Force constant of the string is 50 N/m.



(A) Extension in AB is $\frac{2}{3}$m

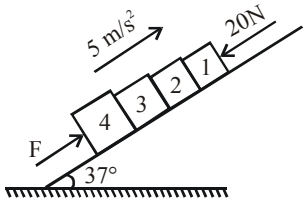
(B) Extension in BC is $\frac{2}{3\sqrt{3}}$m

(C) Extension in AB is equal to extension in BC.

(D) Mass of each particle is 5kg.

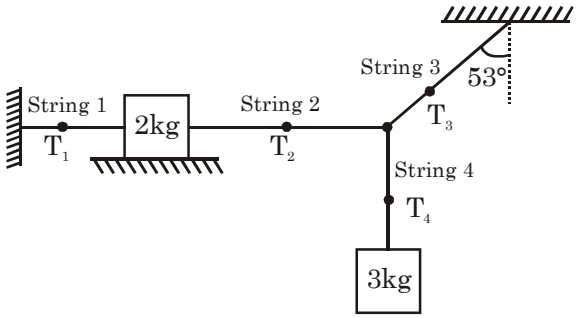
Multiple Correct Answer Type 5 Q. [4 M (–2)]

8. Four block system having masses 1kg, 2kg, 3kg & 4 kg respectively are placed on smooth inclined plane and all blocks are moving upward with acceleration 5 m/s^2. If net force action on 1kg, 2kg, 3kg & 4 kg blocks are F_1, F_2, F_3 & F_4 respectively then :-



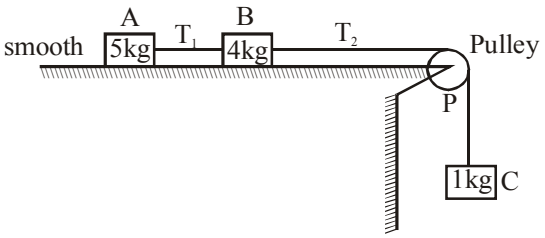
(A) F_1 = 5 N (B) F_2 = 10 N (C) F_3 = 15 N (D) F_4 = 20 N

9. A system of two blocks are connected by the strings as shown in figure. All strings are inextensible and massless and surface is smooth.



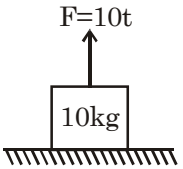
(A) T_1 = 40 N (B) T_2 = 40 N (C) T_3 = 50 N (D) T_4 = 30 N

10. Shown system is released at t = 0. Select correct statement(s) about subsequent motion of blocks. Here strings are massless and pulley is frictionless & massless. [g = 10 m/s^2]



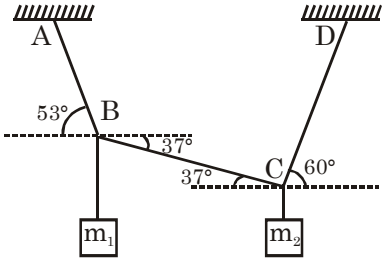
(A) Acceleration of A is equal to 1 m/s^2 (B) Tension T_1=5N
(C) Tension T_2=9N (D) Clamp force on pulley is 9N.

11. A block of m = 10 kg is kept on ground. A vertically upward force F = (10 t)N, where t is the time in seconds starts acting on it at t = 0 as shown in figure.



(A) Time at which block loose contact from the surface is 10 sec.
(B) Velocity of block at t = 20 sec is 50 m/s.
(C) Velocity of block at t = 20 sec is 200 m/s.
(D) Displacement of block in 20 sec is $\frac{500}{3}$ m.

12. For the diagram shown below, m_1 = 10 kg then :

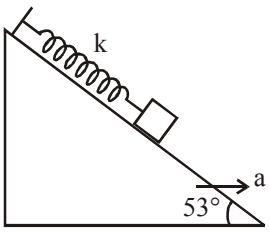


(A) Tension in string AB is $\frac{2000}{7}$ N
(B) Tension in string BC is 1500 N
(C) Tension in string CD is $\frac{2400}{7}$ N
(D) Tension in string CD is 4800 N

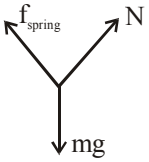
Linked Comprehension Type (1 Para × 2 Q.) [Marks 3 (0)]
(Single Correct Answer Type)

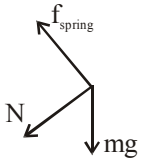
Paragraph for Question No 13 and 14

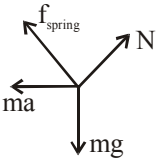
A block of mass m connected to a spring on a wedge as shown in figure. Wedge is accelerated towards right.

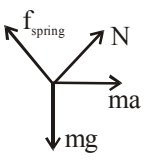


13. Which of the following free body diagram is **CORRECT** w.r.t wedge :-

(A) 

(B) 

(C) 

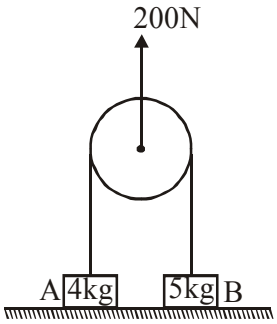
(D) 

14. Which of the following statement is **CORRECT**
(A) If a = g spring will be compressed.
(B) If a = $\frac{4g}{3}$ spring wil be in natural length
(C) Normal reaction between block and wedge reduces as acceleration of wedge is increased.
(D) None

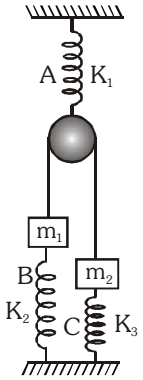
SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **3 Q. [4 M (0)]**

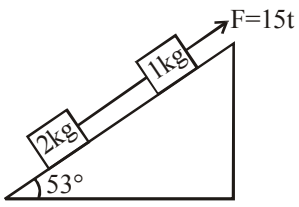
1. Two blocks of masses 4 kg and 5 kg are at rest on the ground. The masses are connected by a massless string passing over a smooth and light pulley. A 200 N force is applied on the pulley. Find the difference in accelerations of blocks in m/s^2.



2. The system shown in figure is in equilibrium. Masses m_1 and m_2 are 2 kg and 2.5 kg respectively. Spring constants K_1 , K_2 and K_3 are 200 Nm^{-1}, 1000 Nm^{-1} & 500 Nm^{-1} respectively. If the elongation in spring A is 20 cm and the compression in spring C is 1 cm then find out the elongation in spring B in cm.



3. In the given figure the maximum value of tension in the string connecting blocks of 1 kg and 2 kg is 50 N. A force varying with time F = 15 t is applied on the 1 kg block as shown. The time (in sec) at which the string breaks is :



CLASS TEST # 17 (TNPS) **ANSWER KEY**

SECTION-I

Single Correct Answer Type **7 Q. [Marks 3 (–1)]**

1. Ans. (D) **2. Ans. (C)** **3. Ans. (B)** **4. Ans. (D)**

5. Ans. (D) **6. Ans. (C)** **7. Ans. (A)**

Multiple Correct Answer Type **5 Q. [4 M (–2)]**

8. Ans. (A,B,C,D) **9. Ans. (A,B,C,D)** **10. Ans. (A,B,C)** **11. Ans. (A,B,D)**

12. Ans. (A,C)

Linked Comprehension Type **(1 Para × 2 Q.) [Marks 3 (0)]**

(Single Correct Answer Type)

13. Ans. (C) **14. Ans. (B)**

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **3 Q. [4 M (0)]**

1. Ans. 5 **2. Ans. 0** **3. Ans. 5**