26. A block rests on an inclined plane that makes an angle θ with the horizontal, if the coefficient of sliding friction is 0.50 and that of static friction is 0.75, the time required to slide the block 4 m along the inclined plane is -
(A) 25 s (B) 10 s (C) 5 s (D) 2 s

27.* A force F accelerates a block of mass m on horizontal surface. The coefficient of friction between the contact surface is μ. The acceleration of m will be -
(A) $\frac{F - \mu mg}{M}$ (B) zero (C) may be (A) or (B) (D) none of these

28. A horizontal force F is exerted on a 20 kg block to push it up an inclined plane having an Inclination of 30º. The frictionalforce retarding the motion is 80 N. For the acceleration of the moving block to be zero, the force F must be-
(A) 206 N (B) 602 N (C) 620 N (D) 260 N

29. A person wants to drive on the vertical surface of a large cylindrical wooden 'well' commonly known as 'death well' in a circus. The radius of the well is R and the coefficient of friction between the tyres of the motorcycle and the wall of the well is μ_s. The minimum speed the motor cyclist must have in order to prevent slipping should be -
(A) $\sqrt{\frac{gR}{\mu_s}}$ (B) $\sqrt{\frac{\mu_s}{gR}}$ (C) $\sqrt{\frac{\mu_s g}{R}}$ (D) $\sqrt{\frac{R}{\mu_s g}}$

30. A spherical ball of mass 1/2 kg is held at the top of an inclined rough plane making angle 30º with the horizontal the coefficient of limiting friction is 0.5. If the ball just slides down the plane without rolling its acceleration down the plane is -
(A) $\left[\frac{2-\sqrt{3}}{4}\right]g$ (B) g (C) $\left[\frac{2\sqrt{3}-1}{4}\right]g$ (D) $\left[\frac{\sqrt{3}-1}{2}\right]g$

31. An object is placed on the surface of a smooth inclined plane of inclination θ. It takes time t to reach the bottom of the inclined plane. If the same object is allowed to slide down rough inclined plane of same inclination θ, it takes time nt to reach the bottom where n is a number greater than 1. The coefficient of friction μ is given by -
(A) $\mu = \tan\theta \left(1-\frac{1}{n^2}\right)$ (B) $\mu = \cot\theta \left(1-\frac{1}{n^2}\right)$
(C) $\mu = \tan\theta \left(1-\frac{1}{n^2}\right)^{1/2}$ (D) $\mu = \cot\theta \left(1-\frac{1}{n^2}\right)^{1/2}$

32. A given object takes n times as much time to slide down a 45º rough incline as it takes to slide down a perfectly smooth 45º incline. The coefficient of kinetic friction between the object and the incline is given by -
(A) $1 - \frac{1}{n^2}$ (B) $\frac{1}{1-n^2}$ (C) $\sqrt{1-\frac{1}{n^2}}$ (D) $\sqrt{\frac{1}{1-n^2}}$

33. A 15 kg mass is accelerated from rest with a force of 100 N. As it moves faster, friction and air resistance create an oppositively directed retarding force given by $F_R = A + Bv$, where A = 25 N and B = 0.5 N/m/s. At what velocity does the acceleration equal to one half of the initial acceleration?
(A) 25 ms^{-1} (B) 50 m/s (C) 75 m/s (D) 100 m/s

34. Two blocks of masses M = 3 kg and m = 2 kg, are in contact on a horizontal table. A constant horizontal force F = 5 N is applied to block M as shown. There is a constant frictional force of 2 N between the table and the block m but no frictional force between the table and the first block M, then the acceleration of the two blocks is-

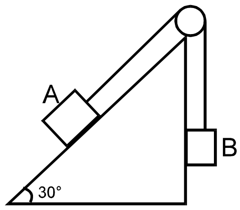
(A) 0.4 ms^{-2} (B) 0.6 ms^{-2} (C) 0.8 ms^{-2} (D) 1 ms^{-2}

35. Block A of mass M in the system shown in the figure slides down the incline at a constant speed. The coefficient of friction between block A and the surface is $\frac{1}{3\sqrt{3}}$.

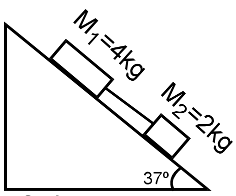
The mass of block B is-

(A) M/2 (B) M/3

(C) 2M/3 (D) $M/\sqrt{3}$



36. Two blocks connected by a massless string slide down an inclined plane having angle of inclination 37°. The masses of the two blocks are M_1 = 4 kg and M_2 = 2 kg respectively and the coefficients of friction 0.75 and 0.25 respectively-



(A) The common acceleration of the two masses is 1.3 ms^{-2}

(b) The tension in the string is 14.7 N

(c) The common acceleration of the two masses is 2.94 ms^{-2}

(d) The tension in the string is 5.29 N

(A) a, d (B) c, d (C) b, d (D) b, c

37. A block of mass m is placed on a rough inclined plane of inclination θ kept on the floor of the lift. The coefficient of friction between the block and the inclined plane is μ. With what acceleration will the block slide down the inclined plane when the lift falls freely ?

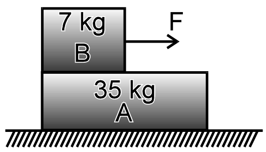
(A) Zero

(B) $g \sin\theta - \mu g \cos\theta$

(C) $g \sin\theta + \mu g \cos\theta$

(D) None of these

38 Block A of mass 35 kg is resting on a frictionless floor. Another block B of mass 7 kg is resting on it as shown in the figure. The coefficient of friction between the blocks is 0.5 while kinetic friction is 0.4. If a force of 100 N is applied to block B, the acceleration of the block A will be ($g = 10\ m\ s^{-2}$) :



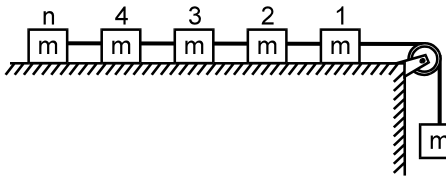
(A) 0.8 $m\ s^{-2}$ (B) 2.4 $m\ s^{-2}$ (C) 0.4 $m\ s^{-2}$ (D) 4.4 $m\ s^{-2}$

39. A wooden block of mass M resting on a rough horizontal surface is pulled with a force F at an angle ϕ with the horizontal. If μ is the coefficient of kinetic friction between the block and the surface, then acceleration of the block is -

(A) $\frac{F}{M}(\cos\phi + \mu\sin\phi) - \mu g$ (B) $F \sin\phi/M$

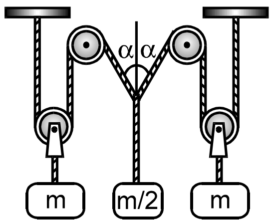
(C) $\mu F \cos\phi$ (D) $\mu F \sin\phi$

40. In the given arrangement, n number of equal masses are connected by strings of negligible masses. The tension in the string connected to n^{th} mass is -



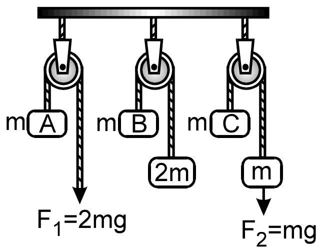
(A) $\frac{mMg}{nm+M}$ (B) $\frac{mMg}{nmM}$ (C) mg (D) mng

41. In the given figure, pulleys and strings are massless. For equilibrium of the system, the value of α is -



(A) 60° (B) 30° (C) 90° (D) 120°

42. In the figure, the blocks A, B and C each of mass m have accelerations a_1, a_2 and a_3 respectively. F_1 and F_2 are external forces of magnitude 2 mg and mg respectively. Then -

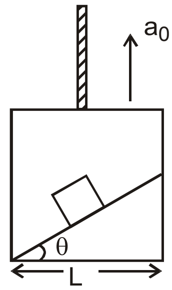


(A) $a_1 = a_2 = a_3$ (B) $a_1 > a_3 > a_2$ (C) $a_1 = a_2$, $a_2 > a_3$ (D) $a_1 > a_2$, $a_2 = a_3$

43. A particle slides down a smooth inclined plane of elevation θ, fixed in an elevator going up with an acceleration a_0 (figure). The base of the incline has a length L. Find the time taken by the particle to reach to the bottom -

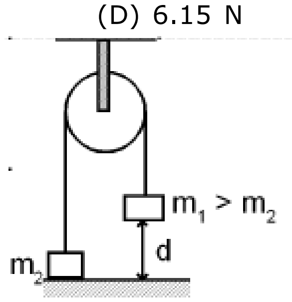
(A) $\left[\frac{2L}{g\sin\theta\cos\theta}\right]^{1/2}$ (B) $\left[\frac{2L}{(g-a_0)\sin\theta\cos\theta}\right]^{1/2}$

(C) $\left[\frac{2L\sin\theta}{(g+a_0)\cos\theta}\right]^{1/2}$ (D) $\left[\frac{2L}{(g+a_0)\sin\theta\cos\theta}\right]^{1/2}$



44. A chain has five rings. The mass of each ring is 0.1 kg. This chain is pulled upwards by a froce F producing an acceleration of 2.50 m/sec^2 in the chain. Then the force of action (reaction) on the joint of second and third ring from the top is -
(A) 0.25 N (B) 1.23 N (C) 3.69 N (D) 6.15 N

45. If the masses are released from the position shown in figure then the speed of mass m_1 just before it strikes the floor is -



(A) $[2m_1gd/(m_1+m_2)]^{1/2}$
(B) $[2(m_1 - m_2)gd/(m_1+m_2)]^{1/2}$
(C) $[2(m_1 - m_2)gd/m_1]^{1/2}$
(D) None of the above

46. The linear momentum P of a body varies with time and is given by the equation $P=x+yt^2$, where x and y are constants. The net force acting on the body for a one dimensional motion is proportional to-

(A) t^2 (B) a constant (C) 1/t (D) t

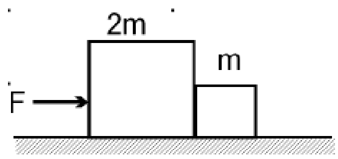
47. A rope of legth L is pulled by a constant force F. What is the tension in the rope at a distance x from the end where the force is applied ?

(A) $\frac{Fx}{L-x}$ (B) $F\frac{L}{L-x}$ (C) FL/x (D) F(L – x)/L

48. The acceleration with which an object of mass 100 kg be lowered from a roof using a cord with a breaking strength of 60 kg weight without breaking the rope is- (assume g = 10 m/sec^2)

(A) 2 m/sec^2 (B) 4 m/sec^2 (C) 6 m/sec^2 (D) 10 m/sec^2

49. Two blocks are in contact on a frictionless table one has a mass m and the other 2m. A force F is applied on 2m as shown is Figure. Now the same force F is applied on m. In the two cases respectively the ratio of force of contact between the two blocks will be-



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

50. In the figure at the free end a force F is applied to keep the suspended mass of 18 kg at rest. The value of F is-