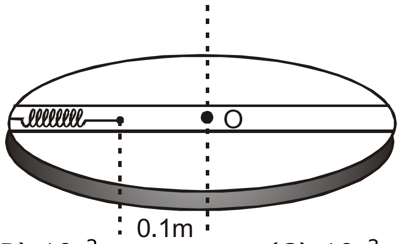
77. A circular turn table of radius 0.5 m has a smooth groove as shown in fig. A ball of mass 90 g is placed inside the groove along with a spring of spring constant 10^2 N/cm. The ball is at a distance of 0.1 m from the centre when the turn table is at rest. On rotating the turn table with a constant angular velocity of 10^2 rad-sec^{-1} the ball moves away from the initial position by a distance nearly equal to-



(A) 10^{-1} m (B) 10^{-2} m (C) 10^{-3} m (D) 2×10^{-1} m

78.* A gramophone record is revolving with an angular velocity ω . A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if-

(A) $r > \mu g\ \omega^2$ (B) $r = \mu g/\omega^2$ only
(C) $r < \mu g/\omega^2$ only (D) $r \leq \mu g/\omega^2$

79. A mass of 2.9 kg, is suspended from a string of length 50 cm, and is at rest. Another body of mass 100 gm moving horizontally with a velocity of 150 m/sec, strikes and sticks to it. What is the tension in the string when it makes an angle of 60° with the vertical

(A) 153.3 N (B) 135.3 N (C) 513.3 N (D) 351.3 N

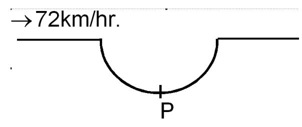
80. The vertical section of a road over a canal bridge in the direction of its length is in the form of circle of radius 8.9 metre. Then the greatest spped at which the car can cross this bridge wihout losing contact with the road at its hgihest point, the centre of gravity of the car being at a height h = 1.1 metre from the ground. Take g = 10 m/sec^2-

(A) 5 m/sec (B) 10 m/sec (C) 15 m/sec (D) 20 m/sec

81.* A car of mass 1000 kg moves on a circular path with constant speed of 16 m/s. It is turned by 90º after travelling 628 m on the road. The centripetal force acting on the car is-

(A) 160 N (B) 320 N (C) 640 N (D) 1280 N

82. A car while travelling at a speed of 72 km/hr. Passes through a curved portion of road in the form of an arc of a radius 10 m. If the mass of the car is 500 kg the reaction on the car at the lowest point P is-



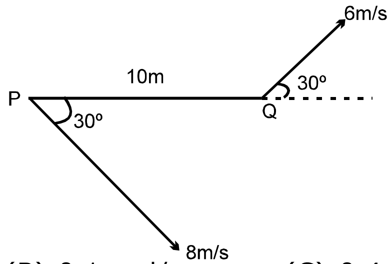
(A) 25 KN (B) 50 KN (C) 75 KN (D) None of these

83. A stone is rotated steadily in a horizontal circle with a time period T by means of a string of length ℓ. If the tension in the string is kept constant and length ℓ increase by 1%, then percentage change in time period T is-
(A) 1 % (B) 0.5 % (C) 2 % (D) 0.25 %

84. A stone of mass 1 kg tied to a light inextensible string of length 10/3 metre is whirling in a vertical circle. If the ratio of maximum tension to minimum tension in the string is 4, then speed of stone st highest point of the circle is- [g = 10 m/s^2]

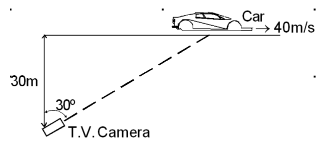
(A) 20 m/s (B) $10\sqrt{3}$ m/s (C) $5\sqrt{2}$ m/s (D) 10 m/s

85. Two moving particles P and Q are 10 m apart at a certain instant. The velocity of P is 8 m/s making 30° with the line joining P and Q and that of Q is 6 m/s making an angle 30° with PQ as shown in the firuge .Then angular velocity of P with respect to Q is-



(A) 0 rad/s (B) 0.1 rad/s (C) 0.4 rad/s (D) 0.7 rad/s

86. A racing car is travelling along a track at a constant speed of 40 m/s. A T.V. camera men is recording the event from a distance of 30 m directly away from the track as shown in figure. In order to keep the car under view in the positio shown, the angular speed with which the camera should be rotated, is-



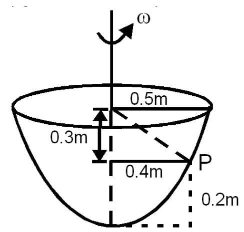
(A) 4/3 rad/sec (B) 3/4 rad/sec (C) $8/3\sqrt{3}$ rad/sec (D) 1 rad/sec

87. A partcile of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2 r t^2$, where k is a constant, the power delivered to the particle by the forces acting on it is-
(A) $2\pi m k^2 r^2 t$ (B) $m k^2 r^2 t$ (C) $(m k^4 r^2 t^5)/3$ (D) 0

88. A partcle rests on the top of a hemisphere of radiu R. Find the smallest horizontal velocity that must be imparted to the particle if it is to leave the hemisphere without sliding down it-

(A) $\sqrt{gR}$ (B) $\sqrt{2gR}$ (C) $\sqrt{3gR}$ (D) $\sqrt{5gR}$

89. A particle P will be in equilibrium inside a hemispherical bowl of radius 0.5 m at a height 0.2 m from the bottom when the bowl is rotated at an angular speed (g = 10 m/sec^2)



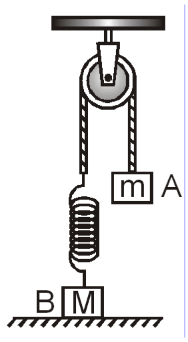
(A) $10 / \sqrt{3}$ rad/sec (B) $10\sqrt{3}$ rad/sec

(C) 10 rad/sec (D $\sqrt{20}$ rad/sec

90. Kinetic energy of a particle moving in a straight line varies with time t as $K = 4t^2$. The force acting on the particle-

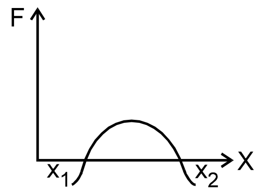
(A) is constant
(B) is increasing
(C) is decreasing
(D) first increase and then decrease

91. In the figure the block A is released from rest when the spring is at its natural length. For the block B of mass M to leave contact with the ground at some stage, the minimum mass of A must be-



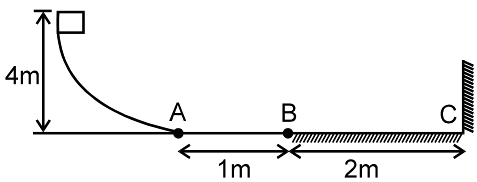
(A) 2 M
(B) M
(C) $\frac{M}{2}$
(D) a function of M and the force constant of the spring

92.* The force acting on a body moving along x-axis varies with the position of the particle as shown in the figure. The body is in stable equilibrium at -



(A) $x = x_1$
(B) $x = x_2$
(C) Both x_1 and x_2
(D) Neither x_1 nor x_2

93. A block of mass m = 0.1 kg is released from a height of 4 m on a curved smooth surface. On the horizontal surface, path AB is smooth and path BC offers coefficient of friction $\mu = 0.1$. If the impact of block with the vertical wall at C be perfectely elastic, the total distance covered by the block on the horizontal surface before coming to rest will be (take $g = 10\ ms^{-2}$) -



(A) 29 m
(B) 49 m
(C) 59 m
(D) 109 m

94. A force $\vec{F} = (2\hat{i} + 5\hat{j} + \hat{k})$ is acting on a particle. The particle is first displaced from (0, 0, 0) to (2m, 2m, 0) along the path x = y and then from (2m, 2m, 0) to (2m, 2m, 2m) along the path x = 2m, y = 2m. The total work done in the complete path is -

(A) 12 J
(B) 8 J
(C) 16 J
(D) 10 J

95. A chain of mass m and length ℓ is placed on a table with one-sixth of it hanging freely from the table edge. The amount of work. done to pull the chain on the table is

(A) $mg\ell/4$
(B) $mg\ell/6$
(C) $mg\ell/72$
(D) $mg\ell/36$

96. The force required to row a boat over the sea is proportional to the speed of the boat. It is found that it takes 24 h.p. to row a certain boat at a speed of 8km/hr, the horse power required when speed is doubled -

(A) 12 h.p.
(B) 6 h.p.
(C) 48 h.p.
(D) 96h.p.

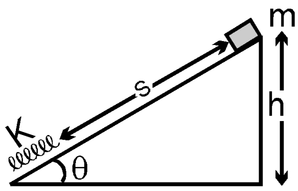
97. A 50 kg girl is swinging on a swing from rest. Then the power delivered when moving with a velocity of 2m/sec upwards in a direction making an angle 60º with the vertical is

(A) 980W
(B) 490W
(C) $490\sqrt{3}$ W
(D) 245W

98. A locomotive of mass m starts moving so that its velocity varies according to thelaw $v = k\sqrt{s}$ where k is constant and s is the distance covered. Find the total work performed by all the forces which are acting on the locomotive during the first t seconds after the beginning of motion.

(A) $W = \frac{1}{8}mk^4t^2$. (B) $W = \frac{1}{4}m^2k^4t^2$ (C) $W = \frac{1}{4}mk^4t^4$ (D) $W = \frac{1}{8}mk^4t^4$

99. A block of mass m slips down an inclined plane as shown in the figure. When it reaches the bottom it presses the spring by a length (spring length <<h and spring constant = K) -



(A) $(2mgh/K)^{1/2}$ (B) $(mgh/K)^{1/2}$
(C) $(2gh/mK)^{1/2}$ (D) $(gh/mK)^{1/2}$

100. Sand drops fall vertically at the rate of 2kg/sec on to a conveyor belt moving horizontally with the velocity of 0.2 m/sec. Then the extra force needed to keep the belt moving is
(A) 0.4 Newton (B) 0.08 Newton (C) 0.04 Newton (D) 0.2 Newton

101. An engine pumps a liquid of density 'd' continuously through a pipe of area of cross section A. If the speed with which the liquid passes through a pipe is v. then the rate at which the Kinetic energy is being imparted to the liquid is
(A) $Adv^3/2$ (B) (1/2)Adv (C) $Adv^2/2$ (D) Adv^2

102. A boy is standing at the centre of a boat which is free to move on water. If the masses of the boy and the boat are m_1 and m_2 respectively and the boy moves a distance of 1 m forward then the movement of the boat is ...... metres

(A) $\frac{m_1}{m_1+m_2}$ (B) $\frac{m_2}{m_1+m_2}$ (C) $\frac{m_1}{m_2}$ (D) $\frac{m_2}{m_1}$