SECTION A **10x1=10**

1. The maximum velocity (in m/s) with which a car driver must raverse flat curve of radius 150 m and coefficient of friction 0.6 to avoidskidding is
   (a)60 (b) 30(c) 15 (d) 25

2. A graph is drawn with a force along y-axis and time along x-axis. The area under the graph represent
   (a) Momentum(b) Couple(c) Moment of the force
   (d) Impulse of the force

3. If two forces are acting at a point such that the magnitude of each force is2N and the magnitude of their resultant is also 2N, then the angle betweenthe two forces is
   (a) 120° (b) 60°(c) 90° (d) 0°

4. If the linear momentum is increased by 50%, then kinetic energy willincrease by
   (a) 50% (b) 100%(c) 125% (d) 25%

5. A spring of force constant 800 Nm^{-1} has an extension of 5 cm. The work donein extending it from 5 cm to 15 cm is
   (a) 16 J (b) 8 J(c) 35 J (d) 24 J

6. Two bodies with kinetic energies in the ratio 4 : 1 are moving with equallinear momentum. The ratio of their masses is
   (a) 4 : 1(b) 1 : 1(c) 1 : 2(d) 1 : 4

   For question numbers 7 to 10, two statements are given-one labeled Assertion (A) and theother labeled Reason ©. Select the correctanswer to these questions from the codes (a), (b), (c) and (d) as given below.
   a. Both A and R are true and R is the correct explanation of A.
   b. Both A and R are true but R is not the correct explanation of A.
   c. A is true but R is false.
   d. A is false and R is also false.

7. **ASSERTION:** Frictional forces are conservative forces.
   REASON: Potential energy can be associated with frictional force.

8. **ASSERTION:** On a banked curved track, without friction, horizontalcomponent of normalreaction provides the necessary centripetal force.
   REASON: Centripetal force is not always required for turning.

9. **ASSERTION:** When a body moves along a circular path no work is done by thecentripetal force.
   REASON: The centripetal force is used in moving the body along a circular path andhence no work is done.

10. **ASSERTION:** Work is done by or against force of friction in moving a body throughany round trip is zero.
    REASON: This is because friction is a conservative force.

## SECTION B   4x2=8

11. a) Why is it difficult to catch a cricket ball than a tennis ball even when both are moving with the same velocity?
    b) Calculate the impulse necessary to stop a 1500 kg car moving at a speed of25 ms^{-1}.

12. A spring balance is attached to the ceiling of a lift. When the lift is atrestspring balance reads 49 N of a body hang on it. If the lift moves:
    (i) Downward
    (ii) upward, with an acceleration of 5 ms^{-2}

13. Find the work done if a particle moves from position r_1=3i+2j-6k to r_2=14i+13j-9k under the effect of force F=4i+j+3k

14. a) Does the P.E. of a spring decreases or increases when it is compressed orstretched?
    b) Define the conservative and non-conservative forces. Give examples ofeach.

SECTION C   4x3=12

15. Three blocks of masses m_1=10 kg, m_2=20 kg are connected by strings on smooth horizontal surface and pulled by a force of 60 N. Find the acceleration of the system and frictions in the string.
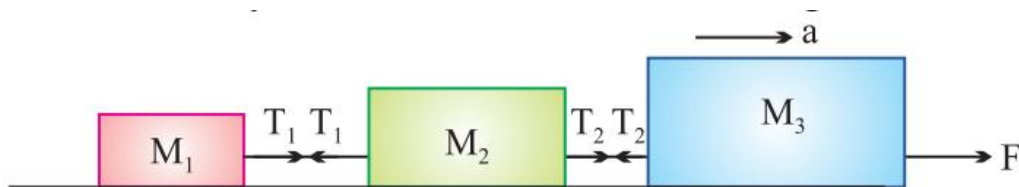
16. Two blocks of mass 2 kg and 5 kg are connected by an ideal string passing over a pulley. The block of mass 2 kg is free to slide on a surface inclined atan angle of 30° with the horizontal whereas 5 kg block hangs freely. Findthe acceleration of the system and the tension in the string.

17. a) A car of mass 2000 kg is lifted up a distance of 30 m by a crane in 1 min. Asecond crane does the same job in 2 min. Do the cranes consume the sameor different amounts of fuel? What is the power supplied by each crane?
    b) State the two conditions under which a force does no work ?

18. Define elastic and inelastic collision. A lighter body collides with a muchmore massive body at rest. Prove that the direction of lighter body is reversed and massive body remains at rest.

SECTION D   **2x5=10**

19. a) Why circular roads are banked? Derive an expression for angle of bankingfor safe circular turn. Consider that coefficient of friction between the tyreand road is μ.

b) Why does a speedy motor cyclist bends towards the centre of a circular pathwhile taking a turn on it ?

20. a) Obtain an expression for minimum velocity of projection of a body at thelowest point for looping a vertical loop with help of neat diagram.

b) Explain why the water doesn't fall even at the top of the circle when the bucket full of water is upside down rotating in a vertical circle?