Total No. of Printed Pages:04

SUBJECT CODE NO: H-122
FACULTY OF ENGINEERING AND TECHNOLOGY
F. E. (All) (CGPA)
Engineering Mechanics
(REVISED)

[Time: Three Hours]   [Max.Marks: 80]

Please check whether you have got the right question paper.
N.B   i) Question numbers one & six are compulsory.
              ii) Attempt any two questions from each section from remaining.
              iii) Figure to the right indicates full marks.
   iv) Assume suitable data if necessary.

SECTION – A

Q.1   Attempt any FIVE from the following.   10
        a) Define resultant force
        b) State law of parallelogram of forces.
        c) What is equilibrant?
        d) State conditions of equilibrium.
        e) Define angle of repose
        f) What is coefficient of friction?
        g) Draw the sketches of simply supported and cantilever beam.
        h) Enlist different types of load on beam.

Q.2   a) The following forces act at a point   07
            1) 200 N inclined at 30° towards North of East.
            2) 250 N towards North.
            3) 300 N towards North – West & at 45°.
            4) 350 N inclined at 40° south of west.
            Find the magnitude & direction of resultant force.

   b) A weight of 100 N is attached by two strings. Calculate the tension in the string.   08
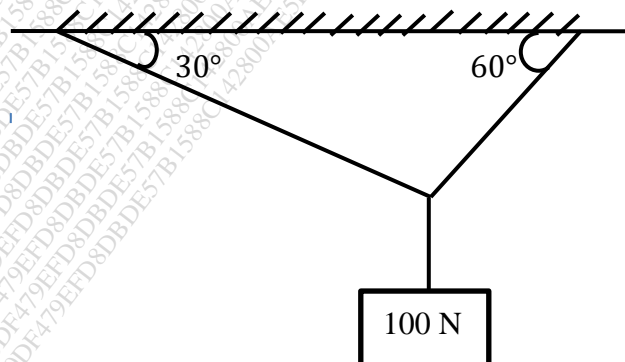
Q.3   a) A block of 500 N is Kept on a horizontal surface. A horizontal force of 190 N is required to   07
           just move it. Find.
           1) Normal reaction
           2) Resultant reaction
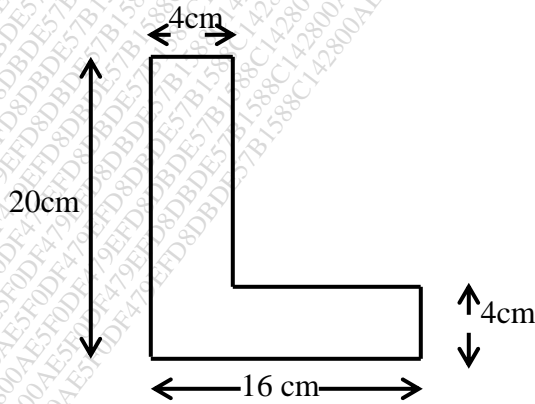   3) Coefficient of friction
           4) Angle of friction

$P = 100\ N$
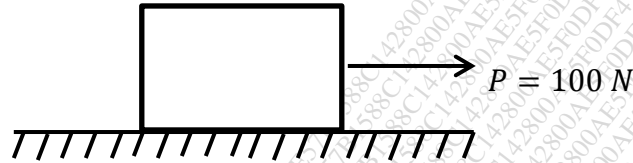
   b) Using method of virtual work, determine the reaction at A & D.   08

20 kN   20 kN

A   1m   B   1m   C   30°   1m   D
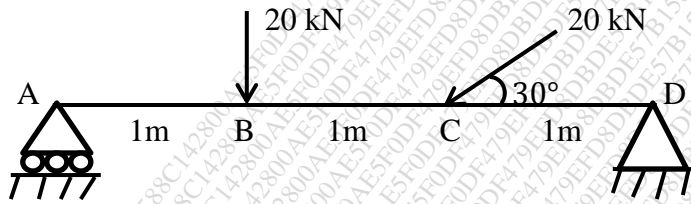
Q.4   For the Frame shown in fig. determine forces in members of the pin jointed frame.   15

A   B   C

3 M

200 kN

E   4 m   D   2 m
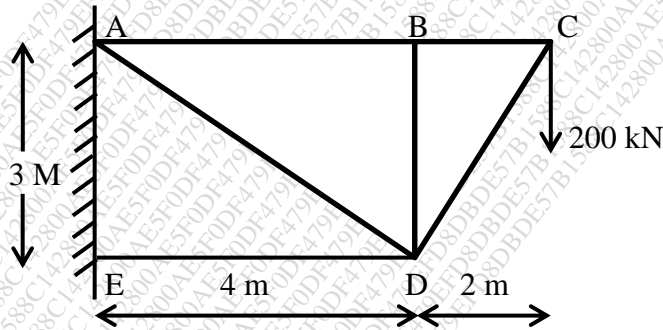
Q.5   Determine Moment of Inertia of L – section about centroidal X – Y axis.   15

4cm

20cm

4cm

←—16 cm—→

SECTION – B

Q.6   Attempt <u>any FIVE</u> questions from the following.   10
    a) Define time of flight.
    b) Define angle of projection.
    c) State the law of conservation of momentum.
    d) Define work.
    e) Define the coefficient of restitution.
    f) Define motion of rotation.
    g) What do you mean by linear motion?
    h) What do you mean by circular motion?

Q.7   a) A stone is dropped from the top of cliff 120 meters high. After one second, another stone is   07
thrown down and strike the first stone when it has just reached the foot of the cliff. Find the
velocity with which the second stone was thrown.

    b) The equation of motion of an engine is given by $s = 2t^3 - 6t^2 - 5$, where (s) is in meters   08
and (t) in seconds.
Calculate
1) Displacement and acceleration when velocity is zero.
2) Displacement and velocity when acceleration is zero.

Q.8   a) A car moving with a velocity of 10 m/s. show down in such a manner that the relation   07
between velocity and time is given by.
$$V = 10 - t^2 - \frac{t^3}{2}$$
Find the distance travelled in two seconds average velocity & avg. retardation of the car in
these two seconds.

    b) A bird is sitting on the top of a tree 10m high. With what velocity should a person, standing   08
at a distance of 25m from the tree, throws a stone at an angle of 30° with the horizontal so as
to hit the bird.

Q.9   a) A force of 300 N act on a body of mass 150kg for 30 seconds. If the initial velocity of the   07
body is 25 m/s, determine the final velocity of the body, when the force.
i) Acts in the direction of motion.
ii) Acts in the opposite direction of motion.

    b) A ball moving with velocity of 4 m/s strikes on a fixed plane at an angle of 30°. If co –   08
efficient of restitution is 0.5, find
i) The direction of body after impact.
ii) Velocity of body after impact.

Q.10   a) A body of weight 1500 N moves on a level horizontal road for a distance of 500 m. the   07
resistance of the road is 10 N per 1000 N weight of the body. Find the workdone on the body
by the resistance.

          b) A car is moving with a velocity of 20 m/s. The car is brought to rest by applying brakes in   08
5 seconds.
Determine
i) The retardation and
ii) Distance travelled by the car after applying brakes.