

ASSIGNMENT Questions of Engg Mechanics.

6 mark on 16 mark questions.

Q/1(1) Find the magnitude of the two forces, such that if they act at right angles, their resultant is $\sqrt{10} \text{ N}$. But if they act at 60° , their resultant is 10 N .

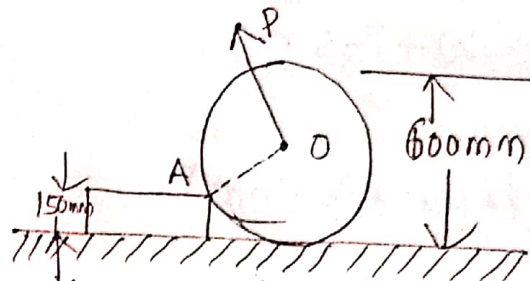
Q/1(2) The resultant of two forces P and Q is R . If Q is doubled, the new resultant is perpendicular to P . Prove that $Q = R$.

Q/1(3) Four forces of 25 N , 20 N , 15 N and 10 N are acting simultaneously along straight lines OA , OB , OC and OD such that

$$\angle AOB = 45^\circ, \angle BOC = 100^\circ, \angle COD = 125^\circ$$

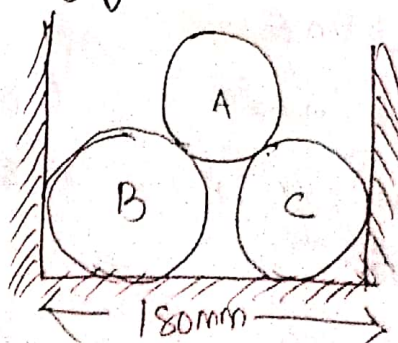
Find magnitude and direction of the resultant force.

Q/1(4) A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in figure.



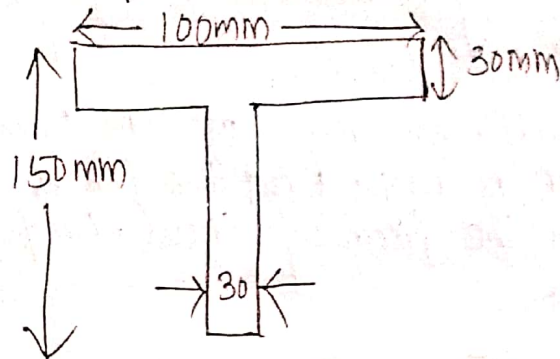
Find the pull through the centre of wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth.

Q/1(5) Three cylinders weighting 100 N each and of 80 mm diameter are placed in a channel of 180 mm width as shown in figure.



Determine the pressure exerted by (i) the cylinder A on B at the point of contact (ii) the cylinder B on the base (iii) the cylinder B on the wall.

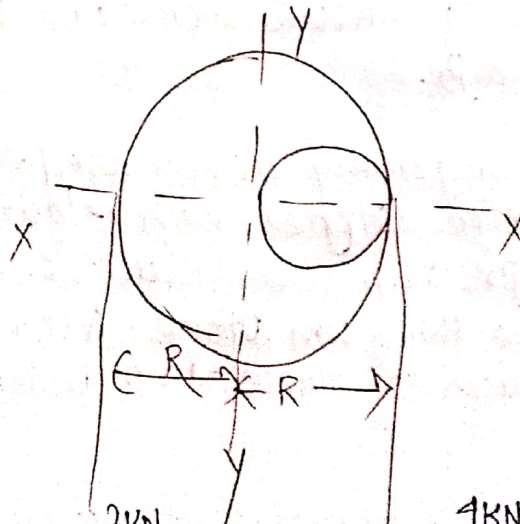
Q/1(6) Find the C.G of a $100\text{mm} \times 150\text{mm} \times 30\text{mm}$ T-Section.



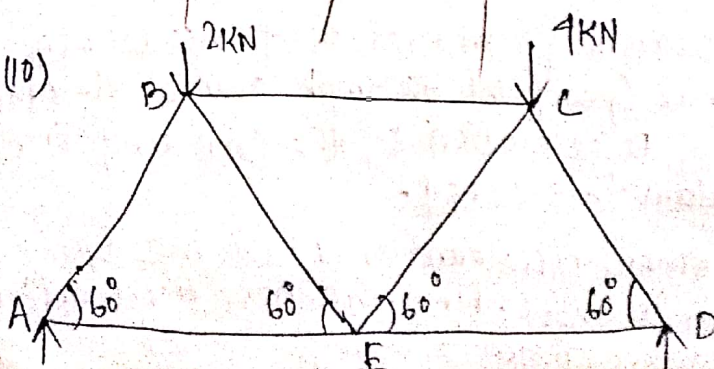
Q/1(7) A Circular sector of angle 45° is cut from the circle of radius 220mm . determine the C.G of the remainder from the centre of the sector.

Q/1(8) Calculate the M.I of an I-Section having equal flanges $30\text{mm} \times 10\text{mm}$ and web also $30\text{mm} \times 10\text{mm}$ about an axis passing through its C.G and parallel to x-x and y-y axes.

Q/1(9) A Circular hole of diameter R is punched out from a circular plate of radius R shown in figure. Find the M.I about both the Centroidal Axis.

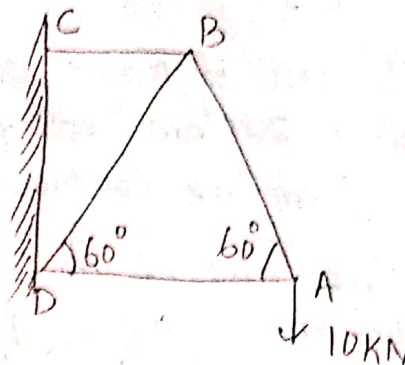


Q/1(10)

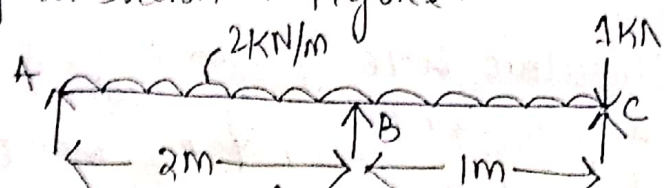


A Warren girder consisting of seven members each of 3m length freely supported at its end points. The girder is loaded at B and C as shown. Find the forces in all the members of the girder, indicating whether the force is compressive or tensile.

Q11(11) A cantilever truss of 3m span is loaded as shown in Fig. Find the forces in the various members of the framed truss, and tabulate the result.



Q11(12) An overhanging beam ABC of span 3m is loaded as shown in figure.



Using the principle of virtual work, find the reactions at A & B.

Q11(13) A train is uniformly accelerated and passes successive kilometer stones with velocities of 18 kmph and 36 kmph respectively. Calculate the velocity when it passes the third km stone. Also find the time taken for each of these two intervals of one km.

Q11(14) A car starts from rest and accelerates uniformly to a speed of 72 kmph over a distance of 500m. Find acceleration of the car and time taken to attain this speed.

If a further acceleration rises the speed to 90 kmph in 10 sec. Find the new acceleration and the further distance moved.

Q15) A cage descends in a mine shaft with an acceleration of 0.5 m/s^2 . After the cage has travelled 25 m , a stone is dropped from the top of the shaft. Determine the

- Time taken by the stone to hit cage
- Distance travelled by the cage before impact.

Q16) A car moves along a straight line whose equation of motion is given by $s = 12t + 3t^2 - 2t^3$ where (s) is in metre and (t) in seconds. Calculate
 (i) velocity and acceleration at start.
 (ii) acceleration when velocity is zero.

Q17) A body moves along a straight line and its acceleration (a) which varies with time (t) is given by $a = 2 - 3t$. After 5 seconds, from start of observations, its velocity is observed to be 20 m/s . After 10 seconds, from start of observation, the body was at 85 m from the origin.

Determine

- Its acceleration and velocity at the time of start.
- Distance from the origin at the start of observations.
- The time after start of observations in which the velocity becomes zero.

Q18) A body starts moving along a straight line with an initial velocity of 8 m/s . The acceleration in m/s^2 at intervals of 5 secs were observed to be as under

t	0	5	10	15	20	25	30
a	0.2	0.8	1.2	1.6	2.0	1.2	0

Find the distance travelled in 30 sec from the start.

Q11(19) A flywheel is making 180 r.p.m and after 20 sec it is running at 120 r.p.m. How many revolutions will it make and what time will elapse before it stops. If the retardation is uniform?

Q11(20) A flywheel rotates with a constant retardation due to braking. From $t=0$ to $t=10$ sec, it made 300 revolutions. At time $t=7.5$ sec, its angular velocity was 40π rad/sec. Determine

- (i) Value of constant retardation
- (ii) Total time taken to come to rest
- (iii) Total revolutions made till it comes to rest.

Q11(21) A bullet of mass 20g is fired horizontally with a velocity of 300 m/s from a gun carried in a carriage which together with the gun has mass of 100 kg. The resistance to sliding of the carriage over the ice on which it rests is 20 N.

Find (a) Velocity, with which the gun will recoil.

(b) Distance, in which it comes to rest

(c) time taken to do so.