

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL
UNIVERSITY, LONERE**

Winter End Semester Examination – Dec 2019

Course: B. Tech.

Sem: I B

Subject Name: Engineering Mechanics EM1203

Max Marks: 60

Date: 20/12/2019

Duration: 3 Hrs.

Instructions to the Students:

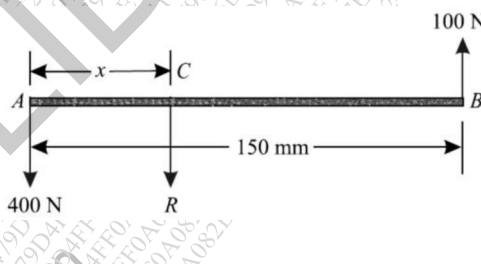
1. All 05 questions are compulsory, however there may be internal choice for few questions.
2. Use of non-programmable scientific calculators is allowed.
3. Assume suitable data wherever necessary and mention it clearly.

Marks

Q.1 A) Define the following: Statics, Dynamics, Equilibrant, Lami's theorem. (4)

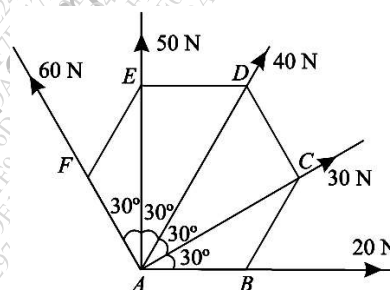
Or

A) Two unlike parallel forces of magnitude 400 N and 100 N are acting in such a way that their lines of action are 150 mm apart as shown in figure. Determine the magnitude of the resultant force and the point at which it acts. (4)



B) Find the magnitude and direction of the resultant force for the number of forces acting at a common point as shown in figure. (8)

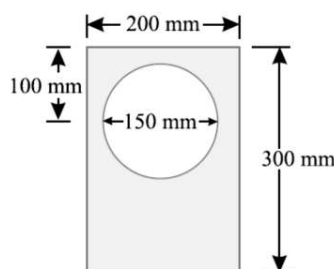
The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order.



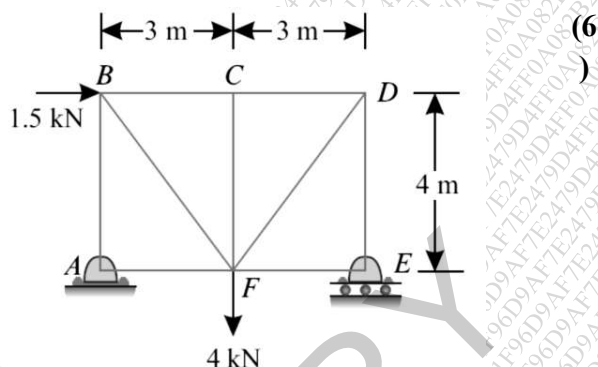
Q.2 Answer any two from the following:

A) What is meant by friction? Mention the laws of static friction. (6)

B) Determine the coordinates x_c and y_c of a plane lamina as shown in figure. A circular portion of diameter 150 mm is cut symmetrically about y direction through a rectangular plate of size 200 mm x 300 mm. (6)



- C) Determine the forces in all the members of a truss shown in figure and tabulate the results in magnitude and direction. Support A is hinge while support E is roller.



- Q.3 A) A wheel increases its speed from 45 r.p.m. to 90 r.p.m. in 30 seconds. Find (i) angular acceleration of the wheel, and (ii) no. of revolutions made by the wheel in these 30 seconds. (6)
- B) A particle is projected inside a horizontal tunnel with a velocity of 60 m/s. The height of tunnel is 5 metres. Find the angle of projection and the greatest possible range. (6)
- Q.4 A) A vehicle, of mass 500 kg, is moving with a velocity of 25 m/s. A force of 200 N acts on it for 2 minutes. Find the velocity of the vehicle : (6)
- (i) when the force acts in the direction of motion, and
- (ii) when the force acts in the opposite direction of the motion.
- B) At a certain instant, a body of mass 10 kg, falling freely under the force of gravity, was found to be falling at the rate of 20 m/s. What force will stop the body in (i) 2 seconds, and (ii) 2 metres? (6)
- Q.5 A) State with mathematical equation: i) Law of conservation of momentum, (8)
- ii) Newton's law of collision of elastic bodies. ()

Or

- A) State and prove the law of conservation of energy. (8)
- B) A railway engine of mass 20 tonnes is moving on a level track with a constant speed of 45 km.p.h. Find the power of the engine, if the frictional resistance is 80 N/t. Take, efficiency of the engine as 80 %. (4)

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