

First/Second Semester B.E. Degree Examination, June/July 2025
Elements of Civil Engineering and Mechanics

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Assume the data if necessary.

Module-1

- 1 a. Explain the role of Civil Engineers in the infrastructure development. (08 Marks)
- b. A truck is to be pulled along a straight road as shown in Fig Q1(b).
 i) If the force applied along rope A is 5 kN inclined at 30° , what should be the force in the rope B, which is inclined at 20° , so that vehicle moves along the road?
 ii) If the force 4 kN is applied in the rope B at what angle rope B should be inclined so that the vehicle is pulled along the road?

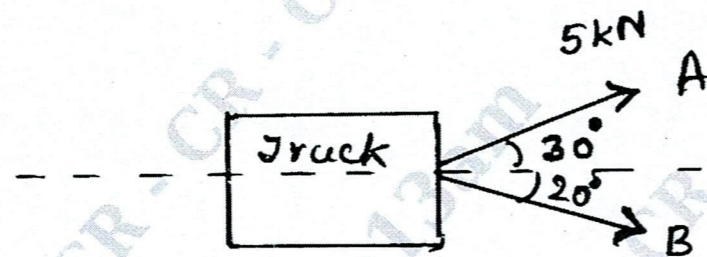


Fig Q1(b)

(06 Marks)

- c. Explain the importance of Transportation engineering and construction technology. (06 Marks)

OR

- 2 a. Explain the parallelogram law of forces. (06 Marks)
- b. Replace the given system of forces acting on the beam AB shown in Fig Q2(b) by
 i) an equivalent force – couple system at A ii) an equivalent force couple system at B.

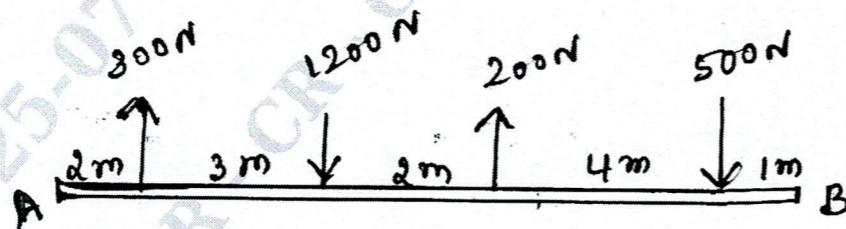


Fig Q2(b)

(08Marks)

- c. Explain the scope of environmental engineering and Hydraulics. (06 Marks)

Module-2

- 3 a. State and prove Lami's theorem. (06 Marks)
- b. Mention the condition of equilibrium for a coplanar non concurrent system of forces. Explain. (06 Marks)
- c. Determine the distance 's' to which the 90 Kg man can climb without causing the 4 m ladder to slip at its lower end. The top of the 15 Kg ladder has a small roller and at the ground the coefficient of static friction is $\mu_s = 0.25$. The mass centre of the man is directly above his feet.

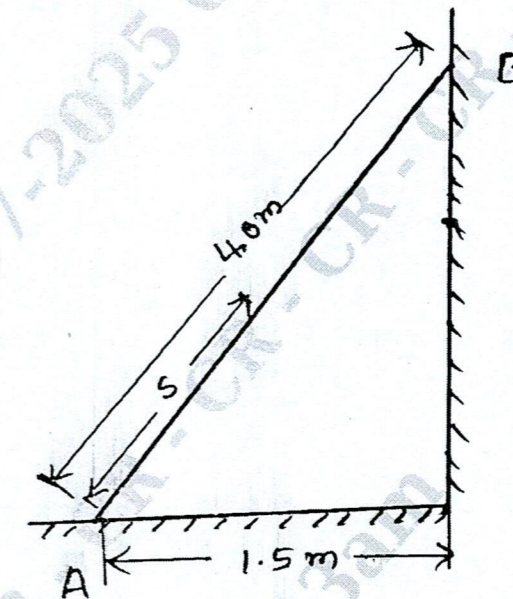


Fig Q3(c)

(08 Marks)

OR

- 4 a. Define : Coefficient of friction, Angle of friction, Limiting friction. (06 Marks)
- b. Explain law of dry friction. (06 Marks)
- c. For the system of strings ABCD shown in Fig Q4(c), determine angle θ such that it is in equilibrium.

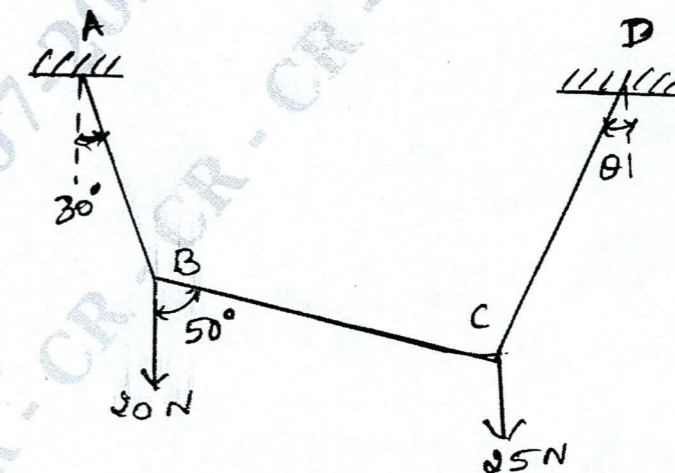


Fig Q4(c)

(08 Marks)

Module-3

- 5 a. With neat sketch, explain different types of loads. (08 Marks)
- b. Beam AB shown in Fig Q5(b), has hinged support at A and roller support at B. Determine the reactions developed at the support when the forces shown in the Fig Q 5(b) are acting.

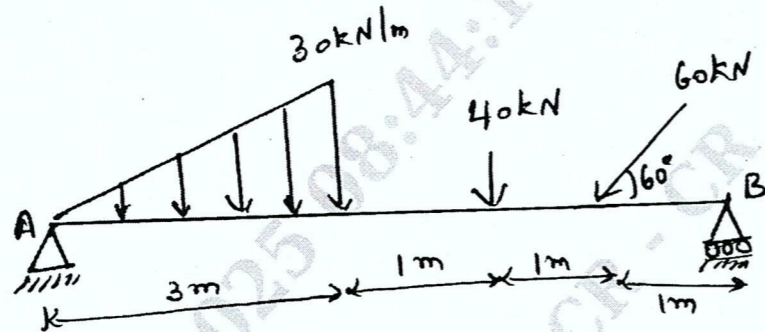


Fig Q5(b)

(12 Marks)

OR

- 6 a. Explain different type of horizontal members which are generally placed on supports. (08 Marks)
- b. Determine the reaction at the support for the beam loaded as shown in Fig Q6(b).

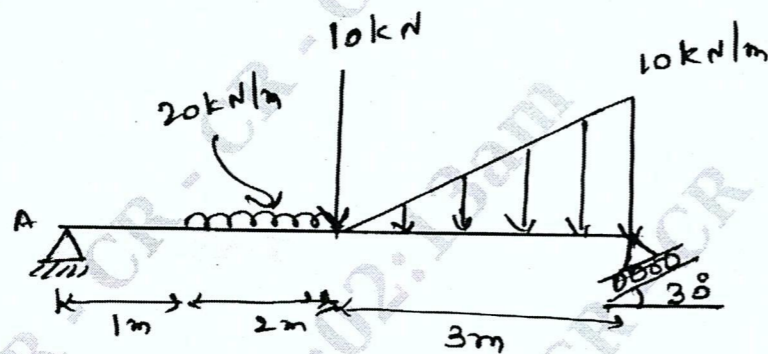


Fig Q6(b)

(12 Marks)

Module-4

- 7 a. State and prove parallel axis theorem. (08 Marks)
- b. Locate centroid of hatched area for the Fig Q7(b)

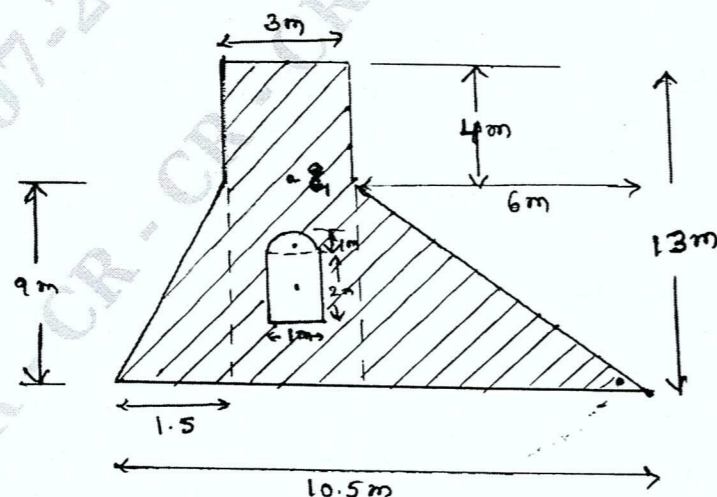


Fig Q7(b)

3 of 4

(12 Marks)

OR

- 8 a. Determine centroid of triangle by method of integration. (08 Marks)
- b. Find the method of inertia of the Fig Q8(b) about the horizontal axis.

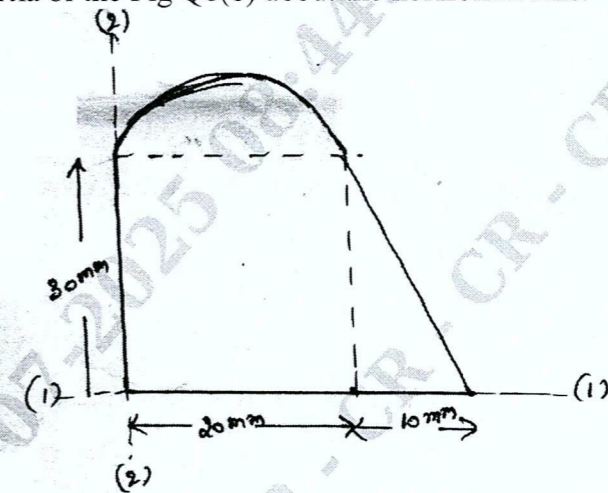


Fig Q8(b)

(12 Marks)

Module-5

- 9 a. Derive all three equations of motion with usual notations. (08 Marks)
- b. The acceleration of a particle moving along a straight line is given by the equation $a = 25 - 3s^2$, where 'a' is the acceleration in m/s and 's' is the displacement in m. The particle starts from rest. Determine :
- Velocity when the displacement is 2 m
 - The displacement when the velocity is again zero
 - The displacement at maximum velocity

(12 Marks)

OR

- 10 a. Show that greatest height reached by a body is given by " $h_{\max} = \frac{u^2}{2g}$ ". (08 Marks)
- b. A small steel ball is shot up vertically with a velocity of 19.6 m/s from the top of a building 30 m high. Calculate :
- Time required for stone to reach maximum height
 - How high the ball rise above the building
 - Compute the velocity with which it will strike the ground
 - Total time for which the ball is in motion.

(12 Marks)
