CBCS SCHEME

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18CIV14/24

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

Time: 3 hrs. 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.

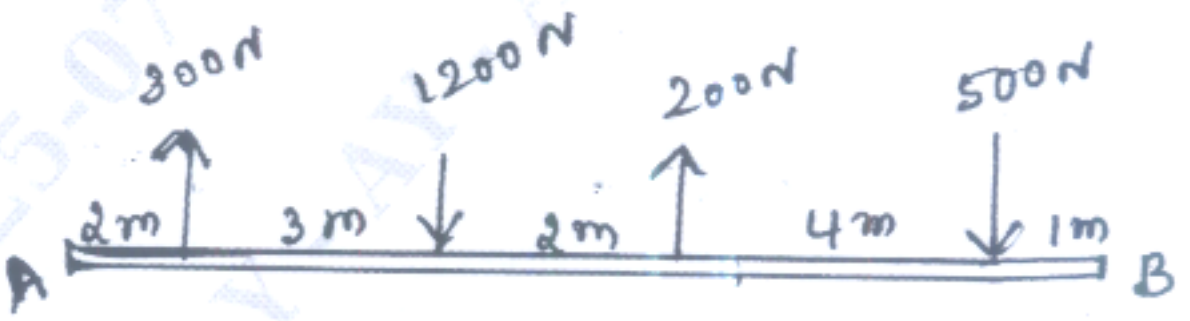

Fig Q2(b **(08Marks)**

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.

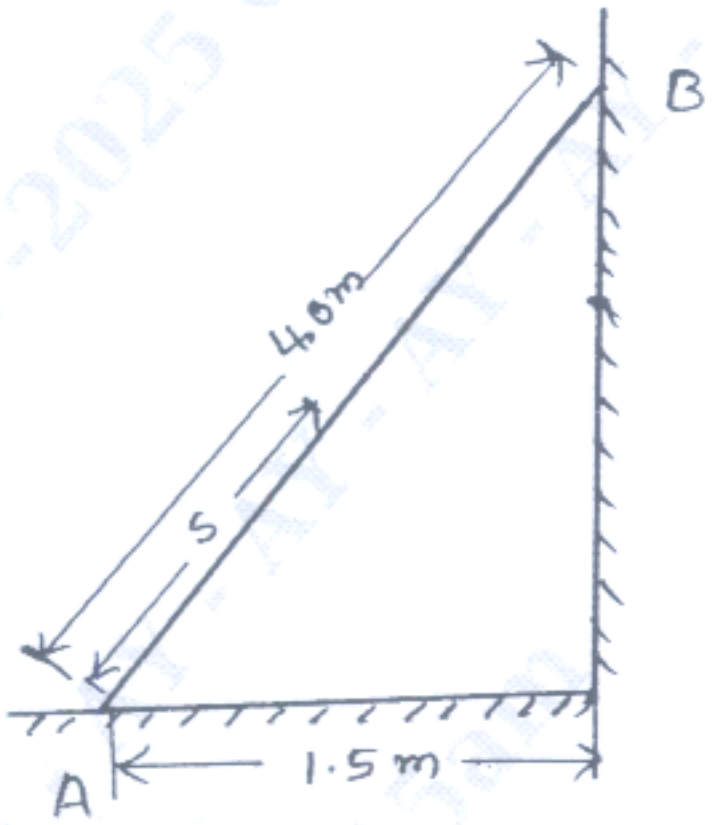

Fig Q3(c) **(08 Marks)**

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.

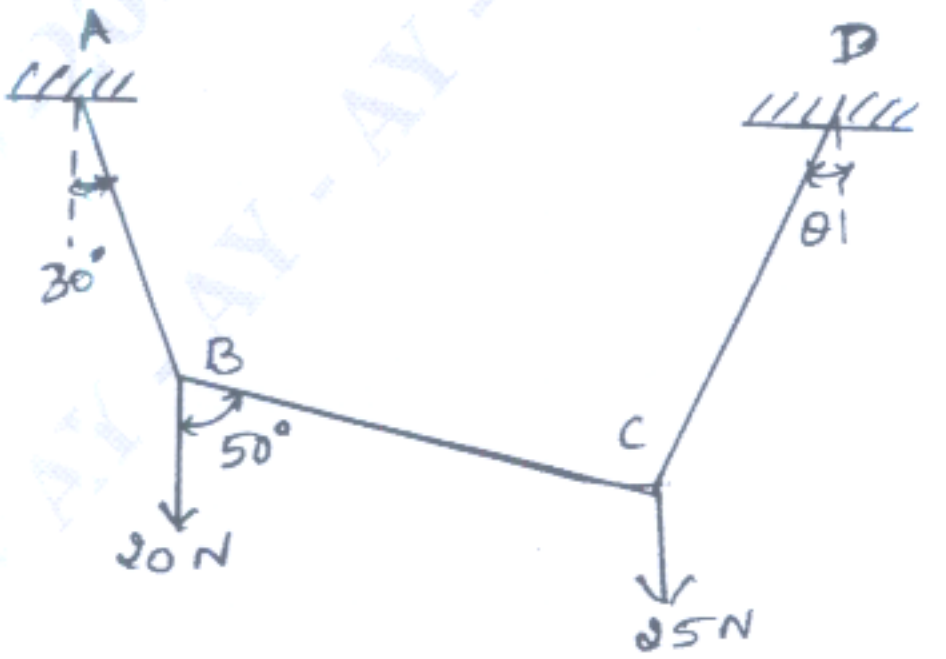

Fig Q4(c) **(08 Marks)**

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.

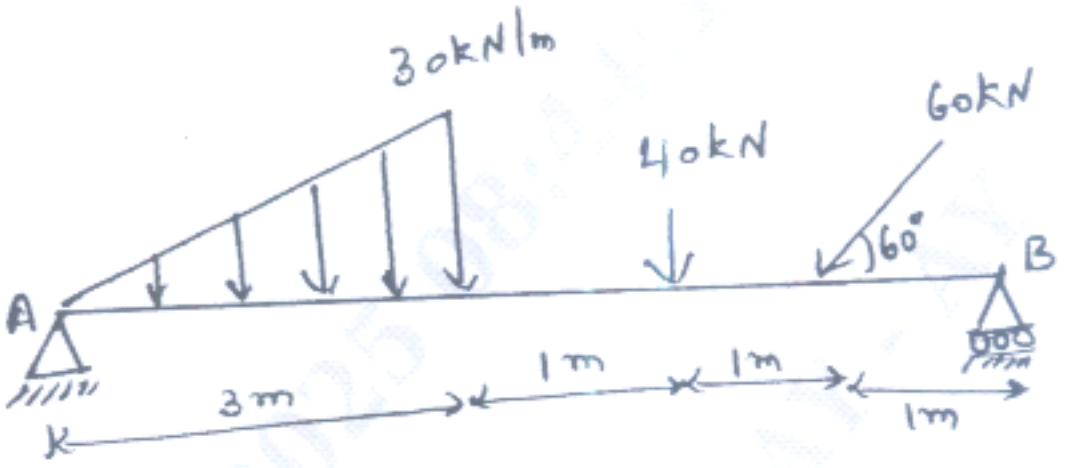

Fig Q5(b) **(12 Marks)**

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).

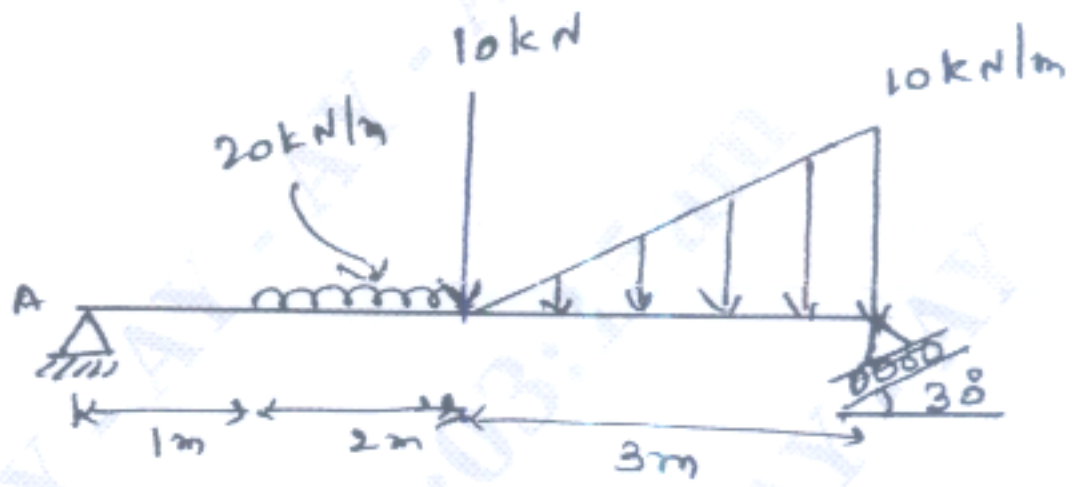

Fig Q6(b) **(12 Marks)**

Module-4

7 a. State and prove parallel axis theorem. **(08 Marks)**

b. Locate centroid of hatched area for the Fig Q7(b)

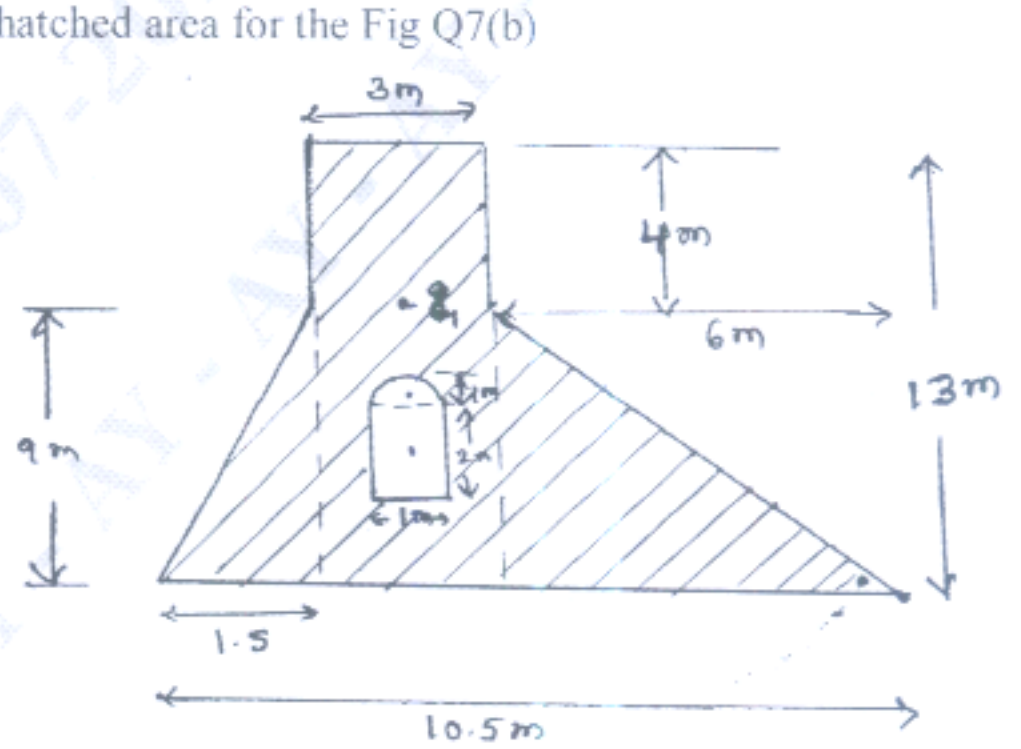

Fig Q7(b) **(12 Marks)**

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.

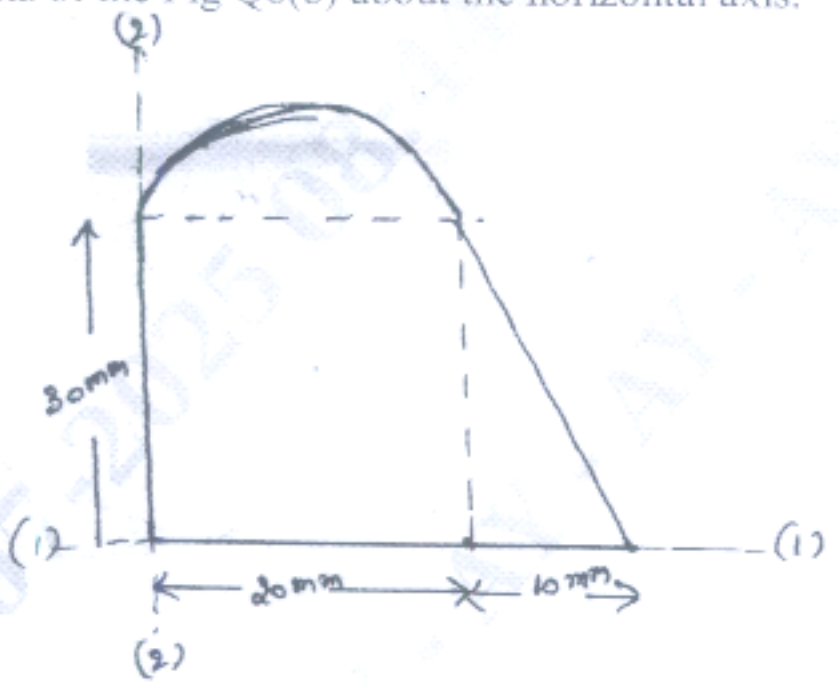

Fig Q8(b) **(12 Marks)**

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 :

i) Velocity when the displacement is 2 m
ii) The displacement when the velocity is again zero
iii) 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 :

i) Time required for stone to reach maximum height
ii) How high the ball rise above the building
iii) Compute the velocity with which it will strike the ground
iv) Total time for which the ball is in motion.

(12 Marks)

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