

CBCS SCHEME

21CIV14/24

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly, explain the role of Civil Engineers in the infrastructure development of the country. (06 Marks)
- b. Explain briefly the scope of following branches :
 - i) Geotechnical Engineering
 - ii) Transportation Engineering
 - iii) Environmental and Sanitary Engineering.(09 Marks)
- c. Write short notes on Smart Materials. (05 Marks)

OR

- 2 a. Outline the importance of the following in the field of Civil Engineering.
 - i) Cement ii) Wood iii) Brick iv) Steel(10 Marks)
- b. Differentiate between RCC and PSC. (05 Marks)
- c. Explain briefly about GIS and Earthquake Engineering. (05 Marks)

Module-2

- 3 a. Explain the following with neat sketches :
 - i) Principle of Transmissibility of forces
 - ii) Parallelogram law of forces(06 Marks)
- b. In a triangle ABC as shown in Fig Q3(b), force at "A" produces a clockwise moment of 90 kN-m at "B" and an anticlockwise moment of 45 kN-m at point "C". Find the magnitude and direction of the force.

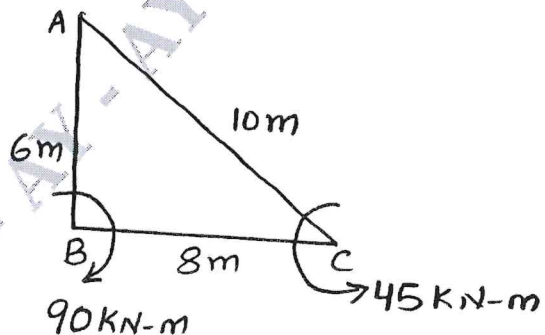


Fig Q3(b)

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Two forces acting on a body are 500 N and 1000 N as shown in Fig Q 3(c). Determine the third force "F" such that, the resultant of all the three forces is 1000 N directed at 45° to the x-axis.

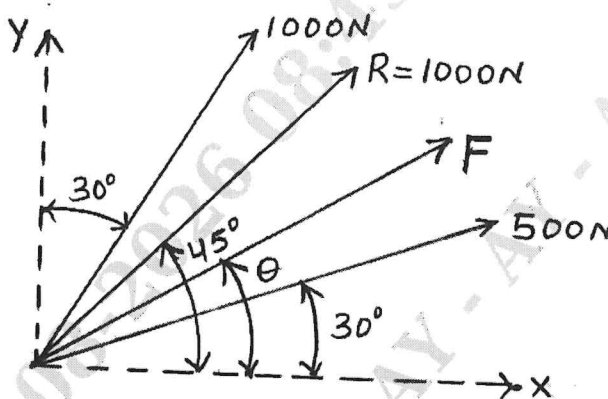


Fig Q3(c)

(08 Marks)

OR

- 4 a. State and prove Varignon's theorem of moment. (06 Marks)

- b. Briefly explain :

- Coefficient of friction
- Angle of friction
- Cone of friction

(06 Marks)

- c. Find the force "P" just required to slide the block "B" in the arrangements shown in Fig Q4(c). Find also the tension in the string.

Take : Weight of block A = 500 N

Weight of block B = 1000 N

$\mu = 0.2$ (co-efficient of friction for all contact surfaces).

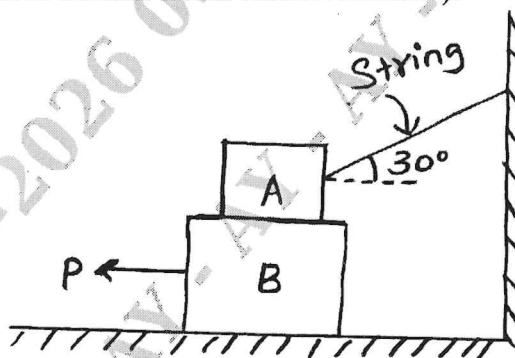


Fig Q4(c)

(08 Marks)

Module-3

- 5 a. Derive the expression for centroid of a semi-circle from first principle. (08 Marks)

- b. Define :

- Radius of gyration
- Polar moment of inertia.

(04 Marks)

- c. Locate the centroid of shaded area shown in Fig Q5(c).

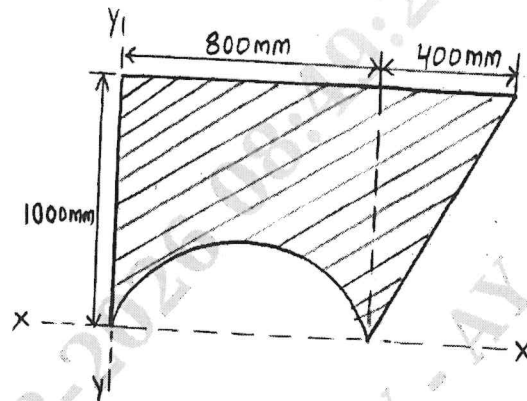


Fig Q5(c)

(08 Marks)

OR

- 6 a. State and prove parallel axis theorem. (08 Marks)
- b. Determine the moment of inertia about the horizontal axis of the plane lamina (Fig.Q6(b)) of the shaded part. Also find Radius of gyration about the horizontal axis.

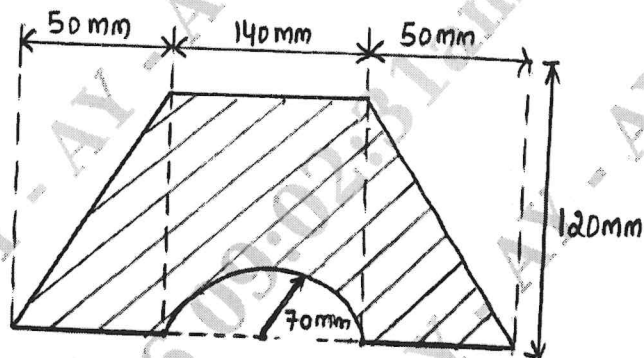


Fig.Q6(b)

(12 Marks)

Module-4

- 7 a. Explain different types of loads and supports with the help of sketches. (08 Marks)
- b. Differentiate statically determinate and indeterminate beams. (03 Marks)
- c. Find the support reactions for the beam loaded as shown in Fig Q7(c)

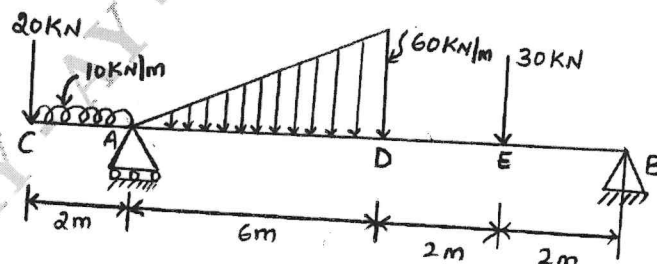


Fig Q7(c)

(09 Marks)

OR

- 8 a. What are the assumptions made in the analysis of trusses? (04 Marks)
- b. Determine the reactions developed in the cantilever beam shown in Fig Q8(b)

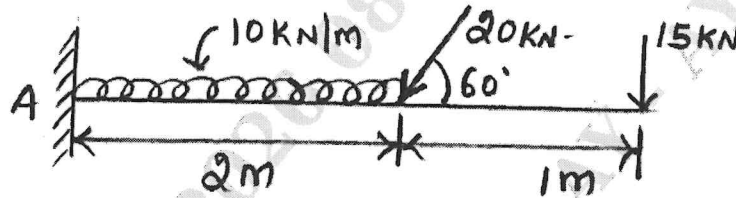


Fig Q8(b)

(06 Marks)

- c. Analyse the truss shown in Fig Q8(c) by the method of joints. Tabulate the result and indicate the nature of force in truss.

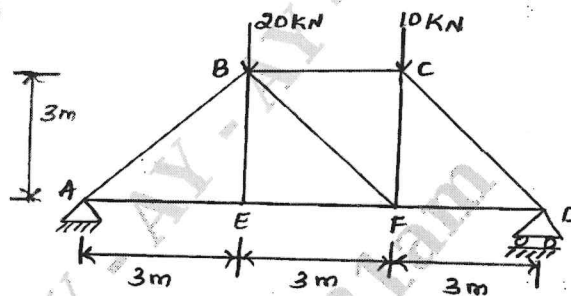


Fig Q8(c)

(10 Marks)

Module-5

- 9 a. Define displacement, acceleration, speed and distance travelled. Mention their respective S.I units. (04 Marks)
- b. Two Car "A" and "B" accelerates from a standing starts, the acceleration of "A" is 1.2 m/sec^2 and that of "B" is 1.5 m/sec^2 . If "B" was originally 5m behind "A", How long it takes to overtake "A"? (08 Marks)
- c. A particle falling vertically under the action of gravity passes two points 10 m apart in 0.2 seconds, find the height from which the particle did start to fall above the higher point. (08 Marks)

OR

- 10 a. What is Super elevation? Why is it necessary? (05 Marks)
- b. State D'Alembert's principle and mention its application in plane motion. (05 Marks)
- c. A projectile is fired from a top of a cliff 150 m high with an initial velocity of 180 m/sec at an angle of elevation of 30° , with the horizontal. Neglecting air resistance, Determine :
- The greatest elevation above cliff
 - The greatest elevation above the ground reached by the particle
 - The horizontal distance from the gun to a point where the projectile strikes the ground.

(10 Marks)
