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B. TECH. III Sem

Main/Back Exam 2025-2026

Civil Engineering

(3CE2-01) - Engineering Mechanics

Time : 3 Hours] **[Max. Marks :** 70

[Min. Passing Marks :

Instructions to Candidates :

Part-A : Short answer questions (up to 25 words) 10 * 2 marks = 20marks. All ten questions are compulsory.

Part-B : Analytical/Problem Solving questions 5 * 4 marks = 20 marks. Candidates have to answer 5 questions out of 7.

Part-C : Descriptive/Analytical/Problem Solving questions 3 * 10 marks = 30 marks. Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination.

(Mentioned in form No. 205)

1_____ 2_____

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Part-A

10x2=20

Q.1 State triangle law of forces. [2]

Q.2 What is moment? list some engineering application of moment. [2]

Q.3 Define the terms centroid and centre of gravity. [2]

Q.4 The centroid of an area always lies on the axis of symmetry, if any, of an area. what does the term axis of symmetry imply? [2]

Q.5 State parallel axes theroem as applied to area moment of inertia. [2]

Q.6 Differentiate between static and kinetic friction. [2]

Q.7 What is cone of friction? State its singificance. [2]

Q.8 Define the terms curvilinear and rectilinear motion of a particle. [2]

Q.9 State the terms tangential acceleration and normal acceleration. [2]

Q.10 Define the terms momentum and implulese. Also, write the impluse momentum equation. [2]

Part-B

5x4=20

Q.1 The sum of two forces acting at a point is 16 N. If the resultant force is 8N and its direction is perpendicular to the minumum force, then determine th forces. [4]

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Q.2 A uniform rod of 10 m has a self weight of 5 N. The rod carries a weight of 30 N hung from one of its ends. From what point the rod be sususpended so that it remains horizontal? [4]

Q.3 Determine the centroid of a rectangle of breadth 'b' and height 'h'. [4]

Q.4 A body weighing 400N is resting on a rough horizontal table. A pull of 120 N applied at an angle of 15 degree with the horizontal just causes the body to slide over the table. Make calculations for the normal reaction and the co-officient of friction. [4]

Q.5 Two cars A and B move at 54 km/hr in the same direction and the car B is 300 m ahead of car A. If the car A is accelerated at 6m/s^2 while the car B continues to move with the same velocity, calculate the time taken by car A to overtake car B. [4]

Q.6 A machine gun fires 180 bullets per minute. Each bullet has a mass of 50 gm and the muzzle velocity of the bullet is 500 m/s. Presuming the firing to be continuous, make calculations for the average reaction of the gun against the support. [4]

Q.7 A box of 60N weight is pulled up along a 30° plane by applying a 50 N force as shown in figure 7 (B). The box starts from rest and the surface of the plane is smooth. What speed the box will attain after travelling 3m up the plane? [4]

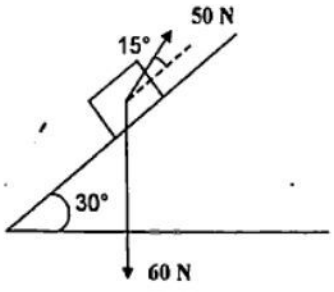


Fig. 7(B)

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Part-C

3x10=30

Q.1 Three cylinderss are piled in a rectangular ditch as shown in figur 1(c), Neglecting friction. determine the reaction between cylinder and the vertical wall. [10]

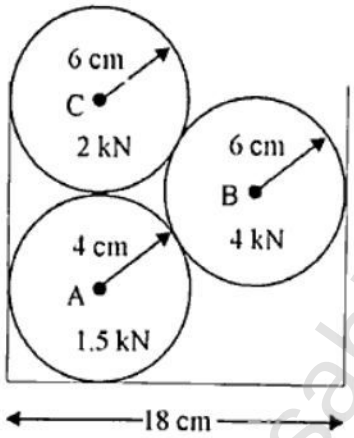


Fig. 1(C)

Q.2 Determine the moment of inertia about x and y centraoidal axis of a beam whose cross sectional area is as shown in figure 2(c). All dimensions are in cm. [10]

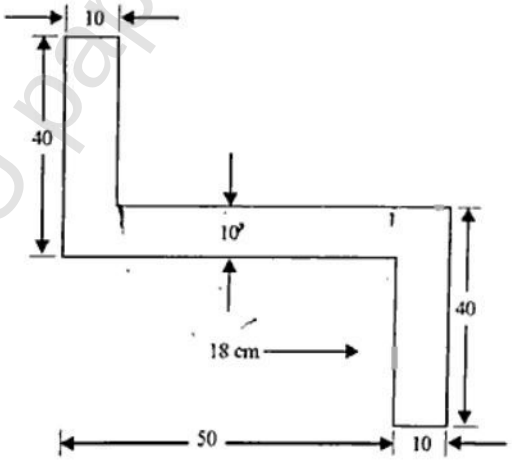


Fig. 2(C)

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Q.3 Two blocks of weight W_1 and W_2 are connected by a string and rest on a rough horizontal plane as shown in figur 3(c), Set up an expression for the magnitude and direction of the least force P that needs to be applied to the upper block to induce sliding. For each block and the surface, the coefficient of friction may be taken as μ. [10]

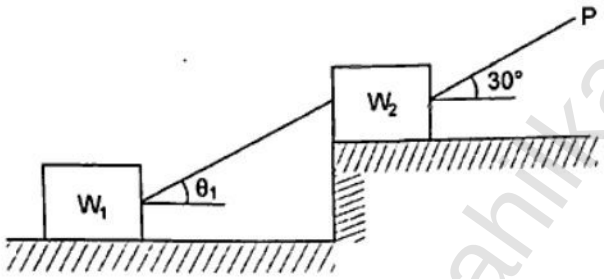


Fig. 3(C)

Q.4 A particle moves along horizontal direction and its position and any instant is prescribed by the relation $x=3t^2-5t^2$.
Where x is in metres and t in seconds.
Make calculations for the following parameters :

(a) displacement during t = 2 sec to 5 sec

(b) average velocity during t = 2 sec to 5 sec and instantaneous velocity at t=2 sec and 5 sec.

(c) average acceleration during = 2 sec to 5 sec and instantaneous acceleration at t = 2 sec to 5 sec.

(d) distance travelled in the first four seconds (t = 0 to t = 4 sec) [10]

Q.5 A flywheel of 1000 kg mass and 0.8 m radius of gyration is rotating at 180 rev/min. Determine its (a) kinetic energy (b) torque and average power required to give the wheel a speed of 180 rev/min in 75 revolutions. [10]

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