Roll No. ..... | Total No. of Pages : 8

ME–1845

B. Tech. (First Semester)
EXAMINATION, 2022-23
ENGG. MECHANICS

Time : Three Hours

Maximum Marks : 100

Note : Attempt questions from both Sections as directed.

Section—A
(Short Answer Type Questions)

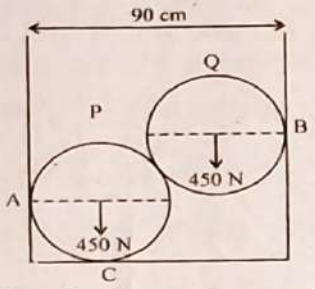
Note : Attempt any *ten* questions. Each question carries 4 marks. 10×4=40

1. Explain Newton's laws of motion. (CO-1, PO-1, BL-2)
2. What do you understand by law of transmissibility of forces ? (CO-1, PO-1, BL-2)
3. Prove and explain parallelogram law of forces. (CO-1, PO-2, BL-3)

P. T. O.

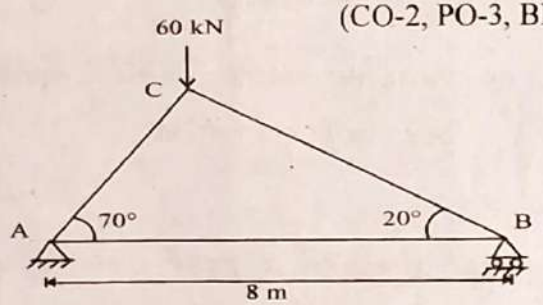
calculations for pressure on the wall and floor at points of contact A, B, C. 10

(CO-1, PO-3, BL-4)



3. Determine the forces, in members and nature of forces in AC, AB, BC of a simple triangular truss with the loading and support as shown in figure by method of joints.

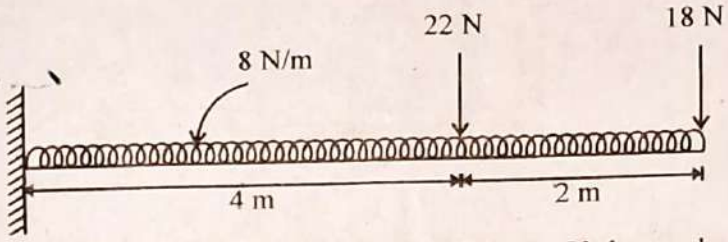
(CO-2, PO-3, BL-4)



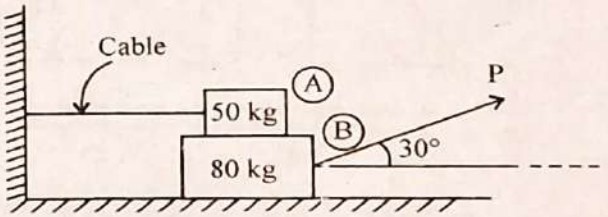
4. (a) Explain simple torsion in the shaft. What are its assumptions. Also prove the torsion equation for shaft. 10 (CO-5, PO-2, BL-6)

(b) Construct the SFD and BMD for cantilever beam as shown : 10

(CO-2, PO-4, BL-5)

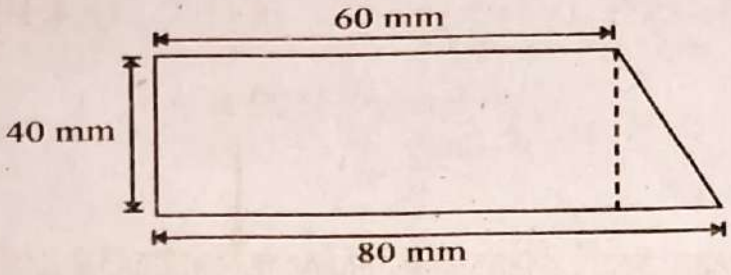


5. (a) Two blocks A & B weighing 50 kg and 80 kg respectively are in equilibrium in the portion shown as fig. Calculate the force P received to move the lower block B and tension in the cable. Take coefficient of friction (H) for all contracting surface to be 0·3. 10 (CO-1, PO-4, BL-4)



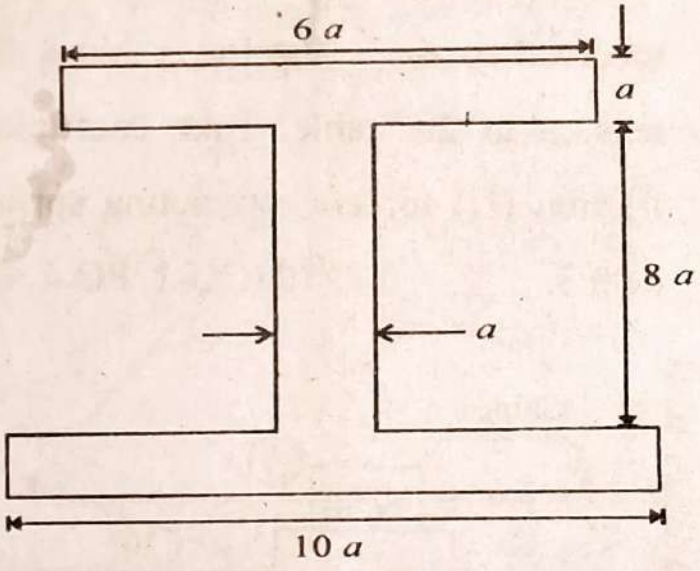
(b) Locate the centroid of lamina as shown :10

(CO-2, PO-3, BL-4)



6. Find the moment of inertia of a rolled steel joint girder of symmetrical I section as shown :

(CO-2, PO-4, BL-3)



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ME–1845

B. Tech. (First Semester)

EXAMINATION, 2020

ENGINEERING MECHANICS

Time : Three Hours

Maximum Marks : 100

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *eight* questions. Each question carries 5 marks. 8×5=40

1. Define a 'Force System'. Name the different force systems. How are the forces classified ?

P. T. O.

2. Find the reactions at supports A and B of the loaded beam as shown in Fig. 1.

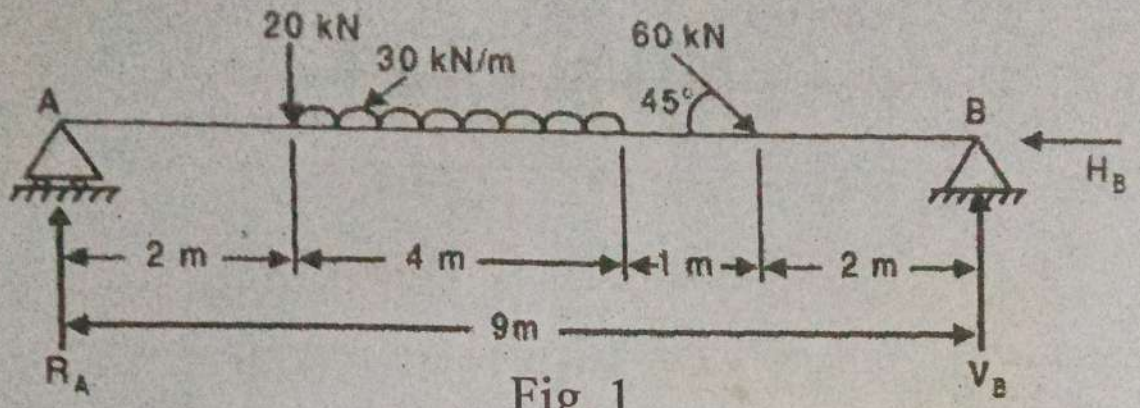

Fig. 1

3. A system of four forces acting on a body is as shown in Fig. 2. Determine the resultant.

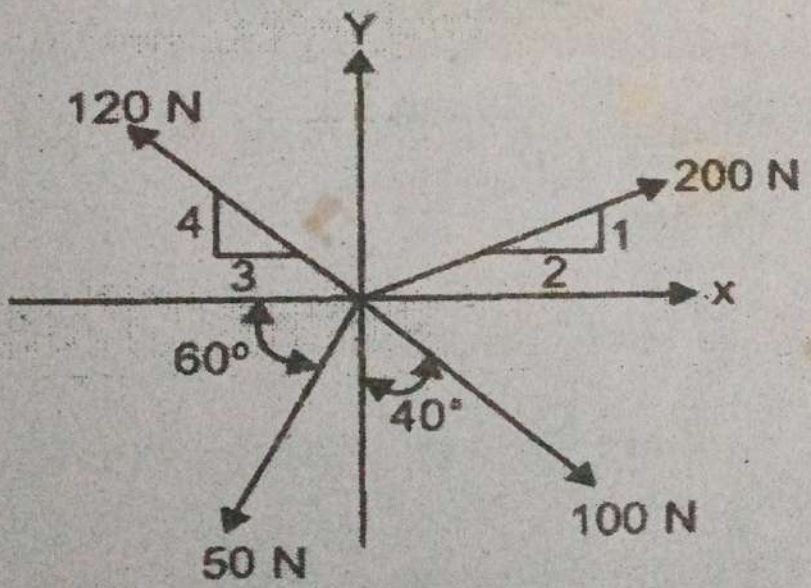

Fig. 2

4. Explain free body diagram with examples. Also write necessary and sufficient condition of equilibrium for coplanar force system.

5. The distance between two stations is 2.6 km. A locomotive starting from one station gives the train an acceleration (reaching a speed of 40 km/h in 0.5 min.) until the speed reaches 48 km/h. This speed is maintained until brakes are applied and the train is brought to the rest at a second station under a negative acceleration of 0.9 m/s. Find the time taken to perform this journey.

6. Explain the following types of supports to beams :
   (i) Simple support
   (ii) Hinged support
   (iii) Fixed support

7. Determine the centroid of the section of the concrete dam shown in Fig. 3.

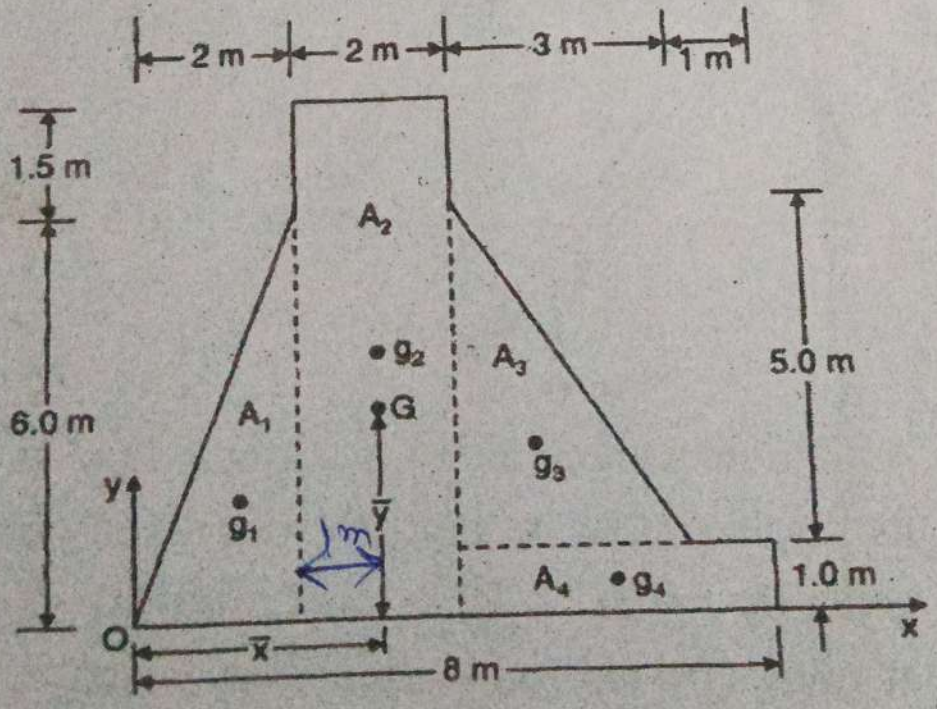

Fig. 3

8. Explain stress-strain curve for ductile material with a neat sketch.
9. Differentiate between structurally determinate and indeterminate beams.
10. What is the value of P in the system shown in Fig. 4 to cause the motion to impend. Assume the pulley is smooth and coefficient of friction between the other contact surfaces is 0.2.

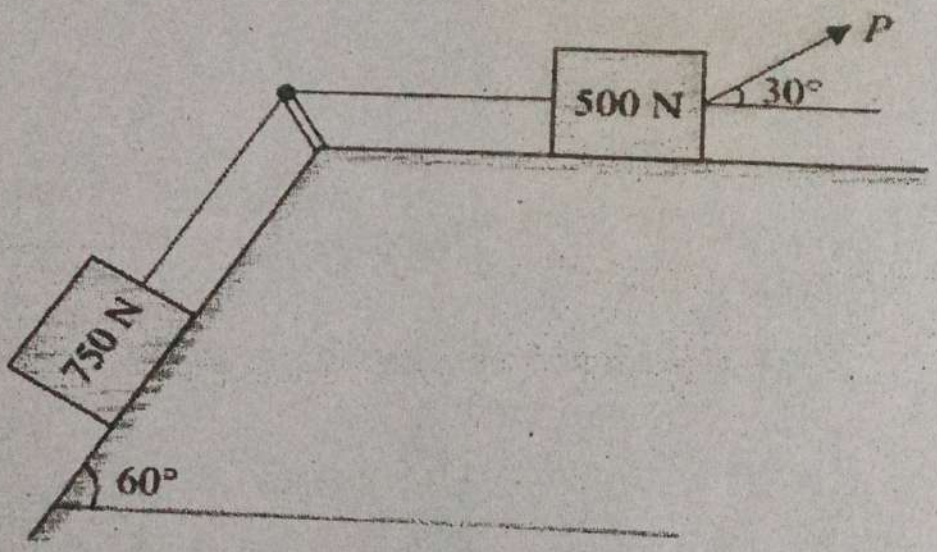

Fig. 4

11. A particle moves along a straight line so that its displacement in metre from a fixed point is given by $s = 3t^3 + 2t^2 + t + 2$. Find (i) velocity at start ($t = 0$) and after four seconds, and (ii) acceleration at start ($t = 0$) and after four seconds.

12. The ladder shown in Fig. 5 is 6 m long and is supported by a horizontal floor and a vertical wall. The coefficient of friction between the floor and the ladder is 0.25 and between the wall and the ladder is 0.4. The weight of the ladder is 200 N and may be considered as a concentrated load at G. The ladder supports a vertical load of 900 N at C which is at a distance of 1 m from B. Determine the least value of α at which the ladder may be placed without slipping. Determine the reaction at that stage.

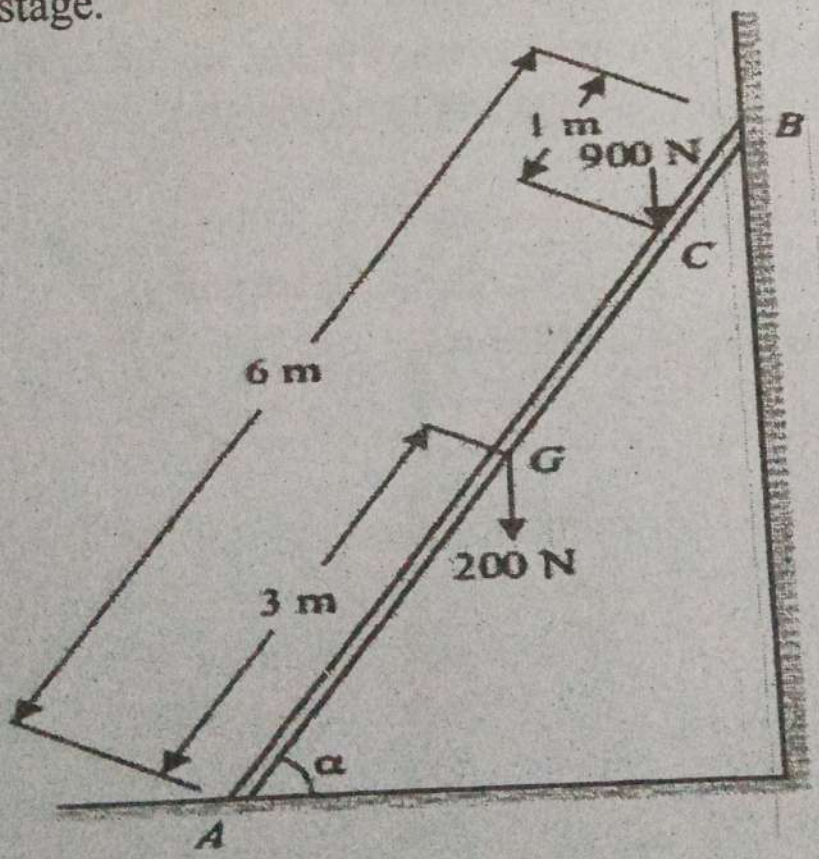

Fig. 5

Section—B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 20 marks. $3 \times 20 = 60$

1. Two blocks connected by a horizontal link AB are supported on two rough planes as shown in Fig. 6. The coefficient of friction on the horizontal plane is 0.4. The limiting angle of friction for block B on the inclined plane is 20°. What is the smallest weight W of the block A for which equilibrium of the system can exist if weight of block B is 5 kN ?

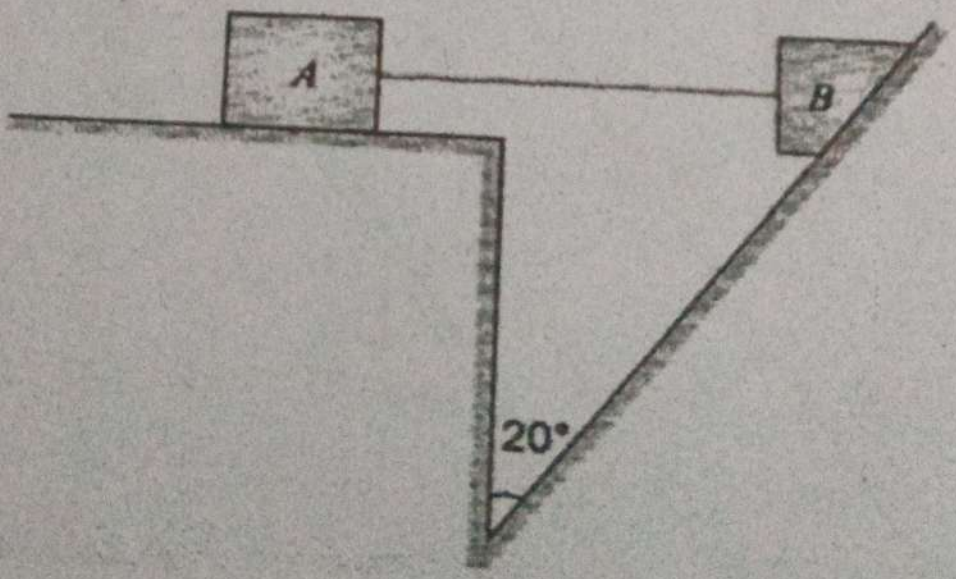

Fig. 6

2. Determine the forces in all the members of the truss shown in Fig. 7 and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.

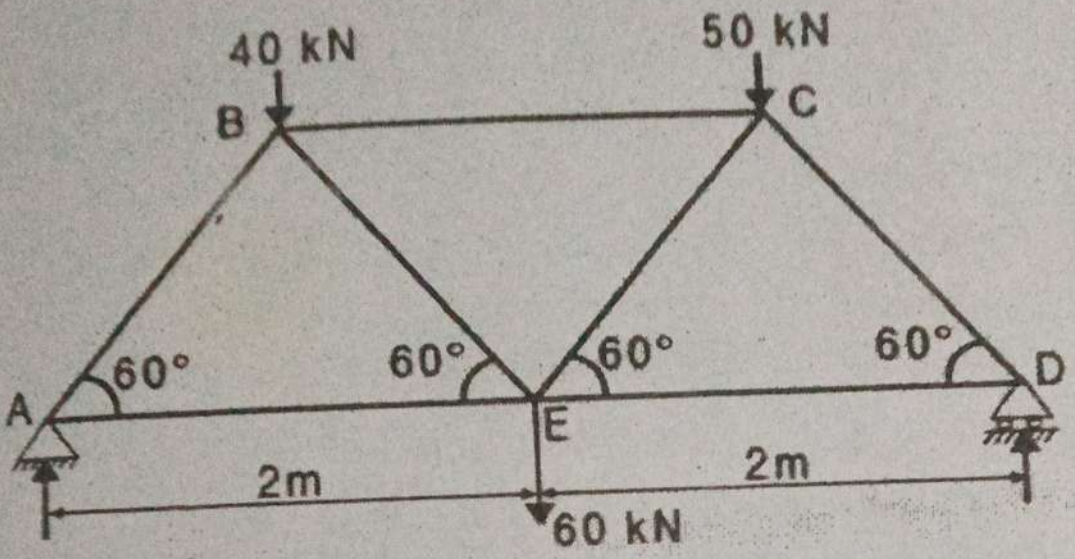

Fig. 7

3. (a) Define pure torsion. Prove the torsion equation with the assumptions.

(b) What do you understand by bending of shaft ? Prove that bending equation with the required assumptions.

4. A beam of span 8 m has roller support at A and hinge support at B as shown in Fig. Draw SF and BM diagrams when the beam is subjected

to u.d.l., a concentrated load and an externally applied moment as shown in the Fig.

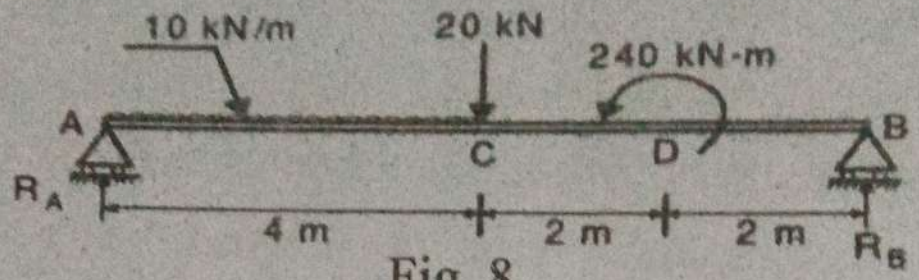

Fig. 8

5. Explain belt friction and its application. Derive the expression for the relationship between tight side and slack forces in a belt friction problem.

6. Compute the second moment of area of the channel section shown in Fig. 9 about centroidal axis X-X and Y-Y.

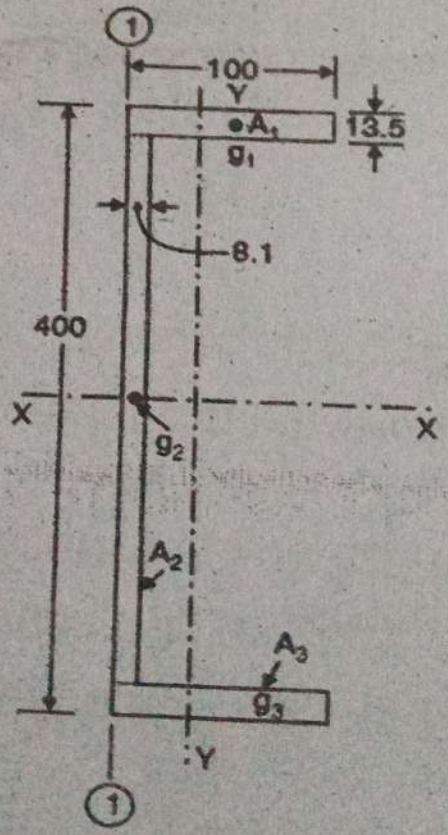

Fig. 9