UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY KANPUR

Semester Examination mid 2

Subject Name: Engineering Mechanics (Branch CSE/ MSME)

Subject code: ESC-S201

Marks: 30

Time: 1.5hrs.

Instructions: Assume any data if required

Section A

1 Friction is a 1

(a) non-contact force (b) contact force (c) magnetic force (d) electrostatic force

2 The magnitude of the force of friction is.....to the force, which tends the body to move. 1

3 Static friction is less than 1

(a) sliding friction (b) rolling friction (c) both (a) and (b) (d) none of these

4 The force of friction is.....of the area of contact, between the two surfaces. 1

a) dependent b) independent c) both of the mentioned d) none of the mentioned

5 Force of friction depends on 1

(a) roughness of surface (b) smoothness of surface

(c) inclination of surface (d) all of these

6 ..... Support develops support moment. 1

a) Hinged b) Simple c) Fixed d) Joint

7 Roller support is same as _____ 1

a) Hinged support b) Fixed support c) Simply support d) Roller support

8 Rough surfaces produce _____ friction than smooth surfaces. 1

9 Friction is always useful to us. 1

(a)Yes (b) No

Section B

1 A light string ABCDE whose extremity A is fixed , has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 450 N at the free end E as shown in Fig below. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W1 and W2 3

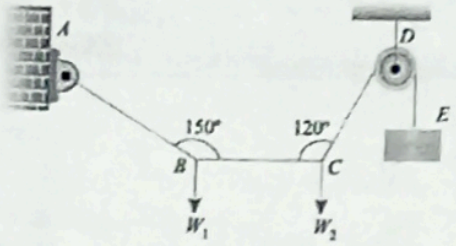


Fig. 1

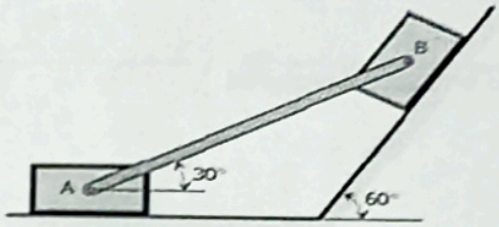


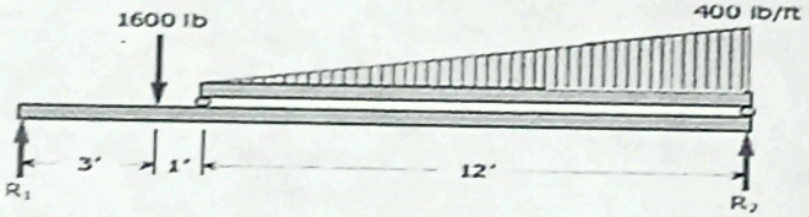
fig. 2

2 In Fig. 2 ,if $\mu = 0.30$ under both blocks and A weighs 400 lb, find the maximum weight of B that can be started up the incline by applying to A a rightward force P of 500 lb. 3

3. A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 25° with the horizontal. 3

Section C

1 Determine the reactions R1 and R2 of the beam in Fig. loaded with a concentrated load of 1600 lb and a load varying from zero to an intensity of 400 lb per ft.. 6



2. A uniform ladder 3 m long weighs 250N. it is placed against a wall making an angle of 60^0 with the floor. The coefficient of friction between wall and ladder is 0.25 and that between the floor and ladder is 0.35. the ladder, in addition to its weight, has to support a man of 1000N at its top at B. calculate; 6
(i) the horizontal force P to be applied to ladder at the floor level to prevent slipping.
(ii) if the force P is not applied, what should be the minimum inclination of ladder with the horizontal, so that there is no slipping of it with the man as its top.

UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY KANPUR

Semester Examination mid 1

Subject Name: Engineering Mechanics (Branch CSE)

Subject code: ESC-S201

Time: 1.5hrs. **Marks: 30**

Instructions: Assume any data if required

Section A

1 Lami's theorem states that
A.Three forces acting at a point will be in equilibrium
B.Three forces acting at a point can be represented by a triangle,each side being proportional to force taken in order,they will be in equilibrium
C.If three forces acting upon a particle are represented inmagnitude and direction by the sides of a triangle,
D.If three forces acting at a point are in equilibrium, each force isproportional to the sine of the angle between the other two 1

2 The forces, which meet at one point and their lines ofaction also lie on the same plane, are known as
A.Coplanar concurrent forces
B.Coplanar non-concurrent forces
C.Non-coplanar concurrent forces
D.Non-coplanar non-concurrent forces 1

3 Which of the following is not a vector quantity?
A.Weight B.Velocity
C.Acceleration D.Force 1

4 A framed structure is perfect, if the number of members are _____ (2j – 3), where j is the number of joints. 1
A.Equal to B.Less than
C.Greater than D.None of these

5 Which of the following material is not used in making trusses?
a) Wooden struts b) Metal bars
c) Channel d) Concrete 1

6 In a truss it is assumes that the members are joined by:-
a) Rough pins b) Smooth pins
c) Either of them d) Neither of them 1

7 Generally, in a truss system compressive parts are thicker than tensile parts. Is it true or false?
a) True b) False
c) Can't say d) Depends upon situation 1

8 Write all types of force system. 1

9 Explain Plane and space truss. 1

P.T.O

Section B

1 Two sphere , each of weight 50 N and of radius 10 cm rest in a horizontal channel of width 36 cm as shown in fig. 1. Fi nd the reactions on the points of contact A, B and C. 3

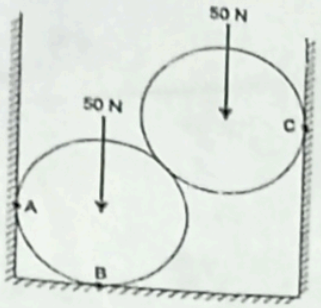


Fig. 1

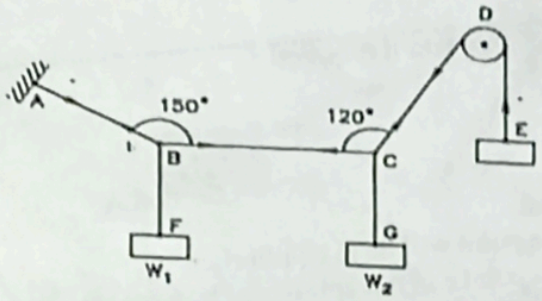


fig. 2

2 A five light string ABCDE whose end A is fixed (fig. no. 2). The weights W_1,. and W_2 are attached to the string B and C and string passes round a small wheel at D carrying a weight 40 kN at the free end E . in position of equilibrium. Find (a) The tensions in AB, BC and DE of.the given string (b) Magnitude of W_1,. and W_2 3

3. State and explain the following laws: (i) Newton's laws of motion. (ii) The gravitational law of attraction 3

Section C

1 Find out the stresses in all the members of the truss (fig. 4). 6

2. A light string ABCDE whose extremity A is fixed,(Fig. no 3) has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig 2.10 below. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W1 and W2. 6

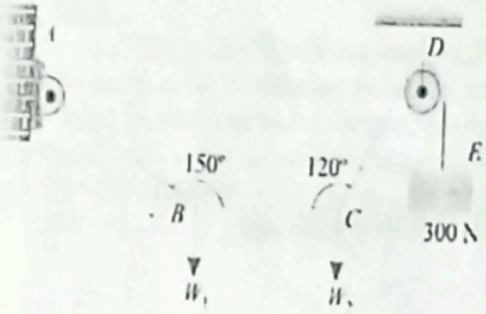


fig. 3

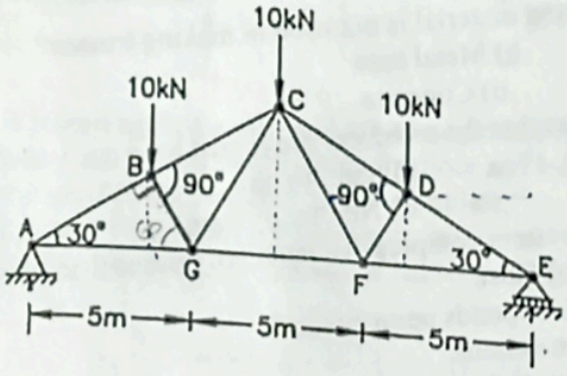


fig. 4

UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY KANPUR

END Semester Examination CSE

Subject Name: Engineering Mechanics (Branch ~~MEE~~/ MSME)

Subject code: ESC-S201

End: Semester Examination

Time: 3:00 hrs **Maximum marks: 50**

All questions are compulsory

Section A

1. The forces, which meet at one point and their lines of action also lie on the same plane, are known as….force — 1
2. A framed structure is perfect, if the number of members are _____ (2j – 3), where j is the number of joints — 1
3. The magnitude of the force of friction is……to the force, which tends the body to move. — 1
4. The centroid of a quarter circle is: — 1
   a. 4R/3π b. R/3π c. 3R/4π d. 2R/3π
5. Centre of gravity of a thin hollow cone lines on the axis of symmetry at a height of _____. — 1
   a. one-half of the total height above base b. one-third of the total height above base
   c. one-fourth of the total height above base d. None of these
6. Explain with examples Non-coplanar non-concurrent forces. — 1
7. Bring out the differences among perfect, deficient and redundant trusses. — 1
8. Explain the terms: coefficient of friction and angle of friction — 1
9. Distinguish between centroid and centre of gravity. — 1
10. State and prove Parallel axis theorem of moment of inertia. — 1

Section B

1 A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height. Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth.(fig. 1) — 4

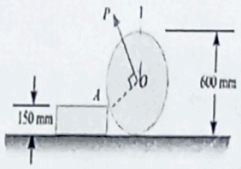


fig. 1

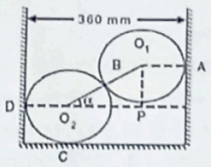


fig. 2

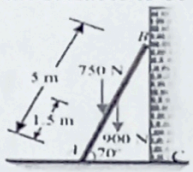


fig 3

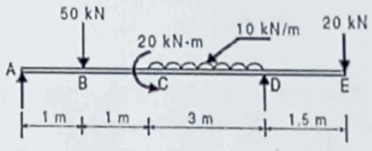


Fig. 4

2 Two smooth spheres each of radius 100 mm and weight 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D shown in Fig. 2 — 4

3 A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750N stands on a rung 1.5metre from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor.(fig. 3) — 4

4 An I-section has the following dimensions in mm units: — 4
Bottom flange = 300 × 100 Top flange = 150 × 50 Web = 300 × 50
Determine mathematically the position of centre of gravity of the section.

5 *Find the reactions at supports of the beam shown in Fig. 4* — 4

Section C

1 *Find the forces in all the members of the truss shown in Fig. 6* — 10

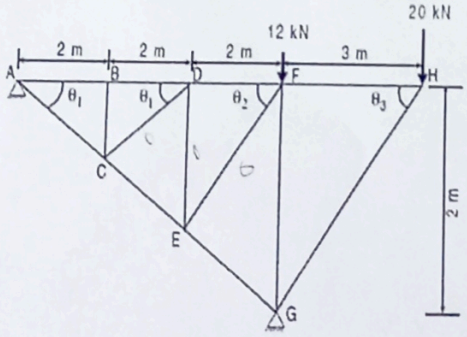


fig. 6

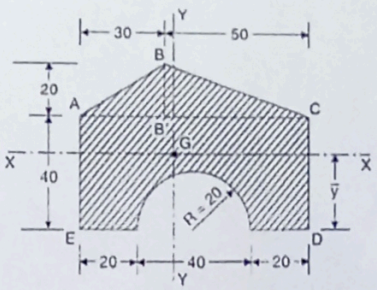


fig . 7

2 *Find the second moment of the shaded portion shown in the Fig. 7 about its centroidal axis.* — 10