

# JK LAKSHMIPAT UNIVERSITY, JAIPUR

## INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Main/Backlog), April-May 2018

B. Tech in CSE, ME, CE, CHE, IInd Sem

Roll No.....

ME201: Engineering Mechanics

Time: 3 hours

Max. Marks: 100

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**Instructions to students:**

1. Do not write anything other than your roll number on question paper.
  2. Assume suitable data wherever required and mention it clearly.
  3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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**Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10**

- i. Newton's first law of motion gives the concept of (a) work (b) force (c) inertia (d) energy
- ii. The apparent weight of a man in a lift is less than the real weight when the lift is going down. (a) Freely (b) under the force of gravity (c) with some constant velocity (d) with some acceleration
- iii. Which of the following statements about friction is true? (a) Friction can be reduced to zero (b) frictional force can accelerate a body (c) frictional force is proportional to the area of contact between the two surfaces (d) static friction is always greater than rolling friction.
- iv. A zero angle of friction implies that (a) friction force is infinite (b) friction force is zero (c) friction force acts normal to the plane (d) friction force acts along the direction of motion.
- v. The moment of inertia of a body is (a) the moment of its inertia (b) the rotational analogue of mass (c) the rotational moment acting on the body (d) the inertia moment acting on the body.
- vi. The moment of inertia of a body does not depend upon (a) shape of the body (b) mass of the body and its distribution within the body (c) axis of rotation of the body (d) angular velocity of the body.
- vii. Which of the following conditions is satisfied for Perfect truss ? (a)  $m + 3 = 2J$  (b)  $m + 3 > 2J$  (c)  $m + 3 < 2J$  (d)  $m + 5 = 2J$ .
- viii. Which axial force is determined while analyzing a truss? (a). compressive force (b). tensile force (c). both a. and b. (d). none of the above
- ix. **Which of the following statements is false about frame/truss?** (a). Bent member is never used in a truss (b). Internal hinges are used to connect members in a truss (c). All members in the truss are two force members (d). Multiforce members can be used in a frame

- x. Which of the following physical quantities is not a vector (a) mass (b) momentum (c) impulse (d) accelerations

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

Q.2A Define Cone of frictions.

Q.2B Newton's third law of motion.

Q.2C Define Angle of friction.

Q.2D Angle of repose.

Q.3A Explain the Types of Friction. 05

Q.3B Explain the Triangle law of forces. 05

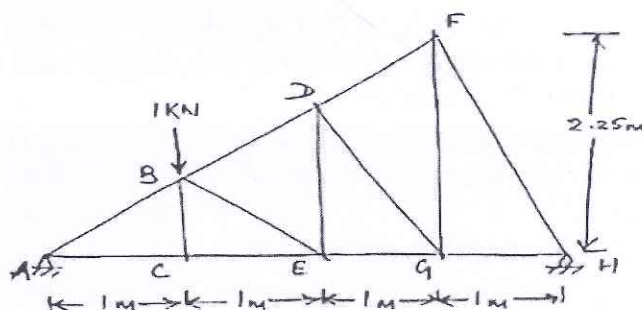
Q.4A Explain the static force, Tension force, Normal reaction force is self adjusting force. 05

Q.4B What is truss ? Explain the assumption for perfect Truss. 05

Q.5A Explain the method of Joints for perfect truss. 05

Q.5B Explain The Newton's Gravitational force. 05

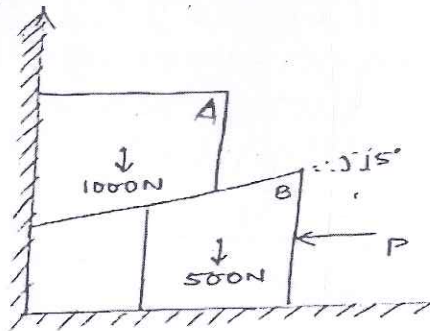
Q.6A A truss is loaded & supported as shown in fig. Find the axial forces in the members BD, DE, & EG. 10



OR

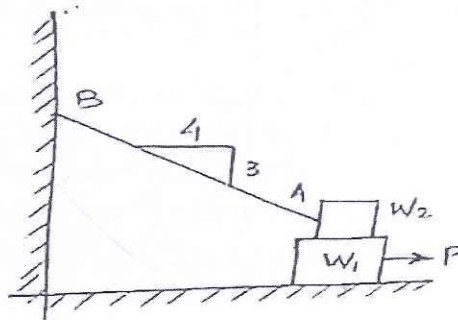
Q.6A The forces 30 N, 40 N, 50 N, 60 N and 70 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant forces. 10

Q.7A Block A weighing 1000 N is to be raised by means of a 15 degree wedge B weighing 500 N. Assuming the coefficient of friction between all contact surface P should be applied to raised the block. 10

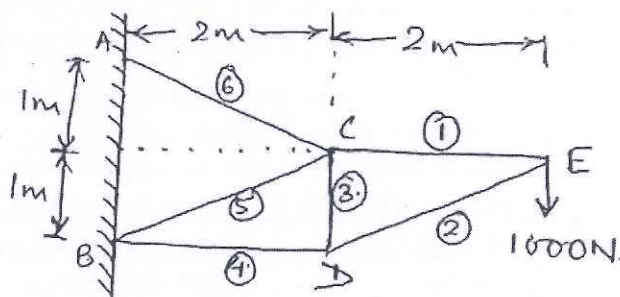


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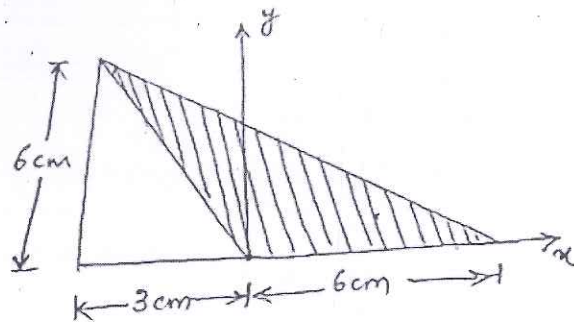
- Q.7A A block of weight  $W_1 = 1000 \text{ N}$  rests on a horizontal surface & supports on its top another block of weight  $W_2 = 250 \text{ N}$ . The weight  $W_2$  is attached by an inclined string  $AB$  to the vertical wall. Find the magnitude of the horizontal force  $P$  applied to the lower block to cause slipping to impend. The coefficient of friction for all contacting surface may be assumed to be  $\mu = 0.3$ . 10



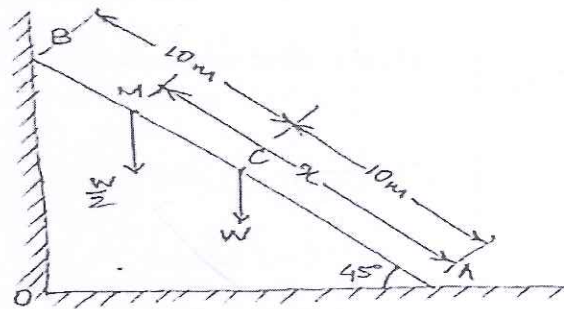
- Q.8A A cantilever truss is loaded as shown in fig. Find the axial forces in all the members. 10



- Q.9A Determine the coordinates of centroid of the shaded area shown in fig. calculate the moment of inertia of this shaded area w.r.t the centroidal set of axes parallel respectively to the  $x$  &  $y$  axis. 10



- Q.9B A uniform ladder AB of length  $L = 20$  m & weight  $W$  is supported by the horizontal floor at A, and by vertical wall at B. It makes an angle  $45^\circ$  with the horizontal. If a man, whose weight is one half that of the ladder, ascends the ladder, how much length  $x$  of the ladder he shall climb before the ladder slips. Take  $\mu_A = 0.5$  and  $\mu_B = 0.33$ . 10



OR

- Q.9B Two blocks of masses  $M_1$  and  $M_2$  are placed on two incline plane of elevation  $\theta_1$  and  $\theta_2$  and are connected by a string as shown in fig. Find the acceleration of the masses. The coefficient of friction between the blocks and the planes are  $\mu$ . Assume  $M_1 = 5$  kg,  $M_2 = 10$  kg,  $\theta_1 = 30^\circ$  and  $\theta_2 = 60^\circ$  and  $\mu = 0.33$ . 10

