



INTERNATIONAL CENTRE FOR APPLIED SCIENCES (Manipal University) I SEMESTER B.S. DEGREE EXAMINATION – NOV. 2017 SUBJECT: ENGINEERING STATICS AND DYNAMICS (CE 111) Friday, 17 November 2017

Time: 3 Hours

Max. Marks: 100

- ✓ Answer FIVE full questions.
- $\checkmark~$ Assume missing data, if any, suitably and indicate them clearly
- 1A. What is a force? Write down different force system classification
- 1B. A system of forces shown in fig. Q. No.1(B) has four forces of which only three are shown. If resultant is 500 N acting as shown, obtain the unknown fourth force
- 1C. Determine the magnitude and y intercept of the resultant with respect to 'O' for the force system acting on a lamina as shown in fig.Q.No. 1(C)
- 1D. Determine the magnitude and location of the resultant for a system of forces as shown in fig. Q.No. 1(D) with respect to 'O'

(5+5+5+5)

- 2A. Two identical rollers M & N, each of weight 500 N are supported by an inclined plane and vertical wall as shown in fig. Q.No. 2(A). Find reactions at contact points A, B, C and D.
- 2B. Determine the support reactions for the beam as shown in fig. Q. No. 2(B).

(10+10)

- 3A. What is the magnitude of force 'P' required to raise the block of weight 10 kN as shown in fig. Q.No.3(A). The coefficient of friction for all contact points is 1/4.
- 3B. What is friction? State laws of dry friction.
- 3C. A ladder 5 m long rests on a horizontal ground and leans against a smooth wall at an angle of 70°. The weight of ladder is 750 N and a man of 900 N initially stands on it at a distance of 1.5 m from base of ladder (fig. Q. No. 3(C)). Calculate the coefficient of friction between ladder and ground. If the man wants to go to the top of the ladder, what is the horizontal force 'P' which has to be applied at the base of the ladder to avoid slipping?

(6+4+10)

- 4A. Find the forces in members AB, BC, AE and BE for the truss shown in fig.Q.No. 4(A) by the method of joints. Also obtain internal and external determinacies. All members are 4m long.
- 4B. Find the forces in members FG, BG and CD for the truss shown in fig.Q.No. 4(B) by method of sections.

(10+10)

- 5A.Obtain the second moment of area for a triangle with respect to is base by direct integration.
- 5B. Locate the centroid of the fig.Q.No.5(B) with respect to given axes.
- 5C. Find Moment of Inertia for the area (fig.Q.No.5(C)) with respect to centroidal axes.

(5+5+10)

- 6A. Determine acceleration of a 50 kg mass and tension in connecting rope for bodies as shown in fig. Q.No.6(A). The 25 kg mass lies on a rough inclined plane with a kinetic friction coefficient of 0.30. The pulley is frictionless (use D' Alembert's method). What is the distance travelled after 1.5 sec
- 6B. A vehicle whose wheel base is 1.50 m and weight 220 kN goes on a curve of 525 m. If the speed is restricted to 80 kmph, what is the tyre pressure if vehicle moves with a speed of 100 kmph.
- 6C. Define terms: a) Particle b) Rigid body c) Kinetics d) Kinematics e) Space (10+5+5)
- 7A. A block of 750 N is released from rest (fig.Q.No. (7A)). Determine the maximum compression of spring. The modulus of spring is 2000 N/m. Coefficient of friction between block and plane is 0.3. Find the maximum velocity of block. Use work energy principle.
- 7B. Two smooth spheres of mass 2 kg and 4 kg impinged so that their initial velocities before impact are 6 m/s and 1.5 m/s inclined at 45° and 60° with the line of centres. If the coefficient of restitution is 0.6, determine their velocities in magnitude and direction after impact.
- 8A. Derive work energy relation for translation.
- 8B. The hammer of a pile driver has a mass of 2500 kg and is dropped freely through 2 m on to the head of a pile of mass of one tonne. If the pile is driven 50 mm into the ground, what is the average resistance of the ground and how much energy is lost at impact? Take $g = 9.81 \text{ m/s}^2$
- 8C. A 60 kg block is pulled up an incline as shown in fig. Q.No.8(C) by a force 'P' of 200 N. Determine the resulting acceleration of the block. Coefficient of kinetic friction is 0.2
- 8D. Define the terms: a) Energy b) Momentum c) Power d) Impact

(5+6+5+4)

(10+10)





Fig. Q. No. 1(C)

Fig. Q. No. 6(A)

Fig. a.No 7(A)

P= 200N ME= 0,2 60 kg 20°

8(C) Fig. Q. No.