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END TERM EXAMINATION

SECOND SEMESTER [B.TECH] MAY-JUNE 2017

Paper Code: ETME-110 **Subject: Engineering Mechanics**

[BATCH : 2013 ONWARDS]

Time: 3 Hours **Maximum Marks: 75**

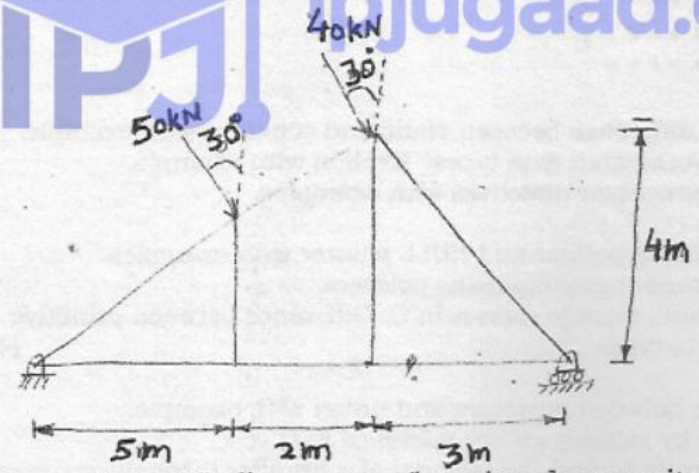
Note: Attempt any five questions including Q no.1 which is compulsory.

Q1 Short questions:- **(5x5=25)**

(a) Classify the force systems.
(b) State and proof varignon's theorem with example.
(c) Explain cone of friction.
(d) State and explain D'Alembert's principle.
(e) What are the assumptions involved in analysis of a perfect truss?

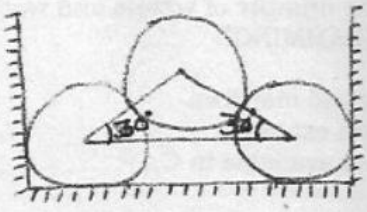
Q2 Derive the expression of the ratio of tensions for the belt pulley system. **(12.5)**

Q3 Find the forces in all the members of the truss shown in figure. **(12.5)**



Q4 Describe the method of finding centre of gravity of composite bent wires. **(12.5)**

Q5 (a) Three identical tubes of weights 8 kN each are placed as shown in figure. Determine the forces exerted by the tubes on the smooth walls and floor. **(6.5)**



(b) State and prove parallel axis theorem. **(6)**

Q6 Derive the expression for the coefficient of restitution. **(12.5)**

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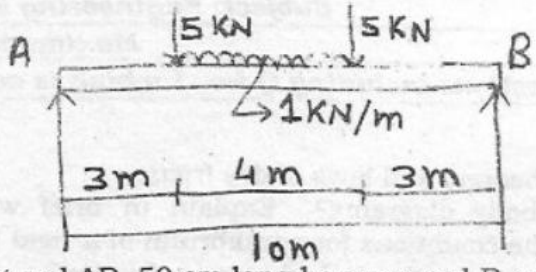
Q7 Draw the shear force and bending moment diagram for the beam shown in figure. **(12.5)**



Q8 (a) A straight rod AB, 50 cm long has one end B moving with a velocity of 4 m/s, and the other end A moving along a vertical line YO as shown in figure. Find the velocity of the end A and of the midpoint of the rod when it is inclined at 60° with horizontal. **(6)**

(b) A stone falls freely from rest and total distance covered by it in last second of its motion equals the distance covered by it in first three seconds of its motion. Determine the time in which the stone remains in air. **(6.5)**

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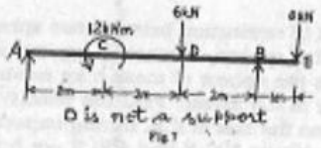

Fig 1

(b) Explain how the general plane motion of a rigid body can be expressed as a combination of translatory and rotary motion. **(6)**

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SECOND SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETME-110	*Subject: Engineering Mechanics* (CBS)
Time: 3 Hours	*Maximum Marks: 75*

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit.

Q1 (a) Explain the parallelogram of forces. **(2.5x10=25)**
(b) What are the assumptions are to be made for the force analysis of trusses?
(c) Define virtual work.
(d) State Impulse-momentum principle.
(e) State work-energy principle.
(f) Define perpendicular axis theorem.
(g) Define angle of repose.
(h) What is point of contra flexure.
(i) Define (i) D'Alembert's principle (ii) Rectilinear translation.
(j) State the laws of dynamic friction.

Unit-I

Q2 (a) Three forces acting on a rigid body are represented in magnitude, direction and line of action by three sides of triangle taken in order as shown in Fig. 1 (a). Prove that the forces are equivalent to a couple whose moment is equal to twice the area of the triangle. **(6)**

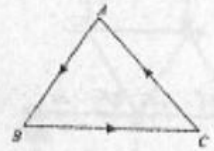

Figure 1(a).

(b) A smooth circular cylinder of radius 1.5 m is lying in a triangular groove, one side of which makes 15° angle and the other 40° angle with the horizontal as shown in Fig 1(b). Find the reactions at the surfaces of contact, if there is no friction and the cylinder weighs 100 N? **(6.5)**

Fig. 1(b).

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SECOND SEMESTER [B.TECH.] MAY-JUNE 2016

Paper Code: ETME-110 ***Subject: Engineering Mechanics (Batch 2013 onwards)***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt any five questions including Q no.1 which is compulsory. Select one question from each unit.

Q1 Short questions:- **(2.5x10=25)**

(a) State the various assumptions for the analysis of a perfect truss.
(b) Explain cone of friction and angle of friction.
(c) Explain the meaning of MA, VR and Efficiency of a screw jack.
(d) What is a point of contraflexture in case of a beam?
(e) Discuss various type of supports used in engineering structures.
(f) What are the advantages of method of section over the method of joints in case of a truss?
(g) Define the coefficient of restitution and instantaneous centre of rotation.
(h) What is self locking in case of a machine and how you will verify whether a machine is self locking or not?
(i) Derive the expression for the moment of inertia of a semi circle about its base.
(j) Discuss the significance and applications of moment of inertia of a body.

UNIT-I

Q2 Three identical spheres P, Q, R of weight W are arranged on smooth inclined surface as shown in the figure 1. Determine the angle θ which will prevent the arrangement from collapsing. **(12.5)**

Q3 Two blocks A and B are connected by a horizontal rod and are supported on two rough planes as shown in Figure 2. If weight of block B is 1500N and coefficient of friction of block A and B are 0.25 and 0.35 respectively, find the smallest weight of block A for which the equilibrium exist. **(12.5)**

UNIT-II

Q4 Determine the forces in the members BC, CE and DE of a truss loaded and supported as shown in Figure 3. **(12.5)**

Q5 Determine the moment of inertia of a cast iron section shown in Figure 4 about both X and Y axis. **(12.5)**

UNIT-III

Q6 In a system of connected bodies (Figure 5) the pulleys are frictionless and of negligible weight. Determine the value of weight A required to give 0.6g acceleration to weight B (i) in downward direction (ii) in upward direction. **(12.5)**

Q7 Two smooth spheres A and B having a mass of 2kg and 4kg respectively collide with initial velocities as shown in Figure 6. If the coefficient of restitution for the spheres is e = 0.8, determine the velocities of each sphere after the impact. **(12.5)**

UNIT-IV

Q8 Draw the shear force and bending moment diagram for the cantilever beam loaded as shown in Figure 7. **(12.5)**

Q9 A reciprocating Engine mechanism is shown in Figure 8. The crank OA is of length 20 cm and rotating at 500 rpm. The connecting rod AB is 100 cm long. Find the angular velocity of the connecting rod and velocity of piston B. **(12.5)**

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END TERM EXAMINATION

SECOND SEMESTER [B.TECH] MAY-JUNE- 2018

Paper Code: ETME-110 **Subject: Engineering Mechanics**

[BATCH 2013 ONWARDS]

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No1 which is compulsory. Select one question from each unit. Assume suitable missing data if any.

Q1 Short questions:- (2.5x10=25)

(a) Define resultant and equilibrant.
(b) What is a couple? What are its properties?
(c) Why co-efficient of dynamic friction is less than that of static friction?
(d) Explain the principle involved in graphical method in the analysis of trusses.
(e) Define moment of inertia of an area. Why it is called the second moment of area?
(f) What is meant by dependent motion? Give example.
(g) State D' Alembert's principle. Why it is called principle of dynamic equilibrium?
(h) How will you locate the instantaneous centre of rotation?
(i) Explain centre of percussion.
(j) Define the term shear force and bending moment at the cross-section of a beam.

UNIT-I

Q2 (a) A bracket is subjected to a force as shown in fig 2(a). Find an equivalent force couple at A. (6.5)

(b) Find the reactions at the supports A and C of the bent shown in fig 2 (b). (6)

Q3 (a) What is a screw jack? Explain the principle on which it works. (3.5)

(b) A rectangular prism weighing 150 N is lying on an inclined plane whose inclination with the horizontal is shown in fig 3 (b). The block is tied by a horizontal string which has a tension of 50 N. Using first principles, find (i) the frictional force on the block (ii) the normal reaction at the inclined plane (iii) the co-efficient of friction between the surfaces of contact. (9)

UNIT-II

Q4 (a) Explain the principles involved in (i) method of joints (ii) method of sections in the analysis of trusses. (4)

(b) For the simply supported truss shown in fig 4(b), find the forces in the members BD, DE and EG. (8.5)

Q5 (a) Drive from first principles, the centroid of a cone. (6)

(b) A rectangular hole is made in a triangular area as shown in fig 5 (b). Find the M.O.I of the shaded area about the centroidal horizontal and vertical axes. Width of the hole is 20 cm. (6.5)

UNIT-III

Q6 (a) A stone is dropped from the top of a building. It was found that during the last one second of its journey, it has covered one-seventh of the height of the building. Find the height of the building. (6)

(b) A car enters a curve of 200 m radius at a speed of 45 kmph. If the car increases its speed at a rate of $2 m/s^2$, what will be its total acceleration when the car has travelled 450 m along the curve. (6.5)

Q7 (a) Explain work of a force. (4)

(b) State and explain the law of conservation of linear momentum. (4)

(c) Prove that the two elastic bodies of equal masses exchange velocities in the case of direct central impact. (4.5)

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UNIT-IV

Q8 (a) A roller of radius 10 cm rides between two horizontal bars moving in the opposite directions as shown in fig 8 (a). Assuming no slip at the point of contacts A and B, locate the instantaneous centre of the roller. Where will be the instantaneous centre when both the bars are moving in the same direction? **(4)**

(b) In the mechanism shown in 8(b), AB rotates clockwise with an angular velocity of 10 rad/sec. Find the angular velocities of bars BC and CD, when the bar AB makes an angle of 30^0 with the horizontal, bar CD makes an angle of 60^0 and the bar BC is horizontal. **(8.5)**

Q9 (a) A uniform bar of mass m and length l hangs from a frictionless hinge. It is released from rest from the horizontal position. Find the angular and linear velocity of its mass centre when it is in vertical position. **(4)**

(b) Draw the SF and BM diagrams for the beam loaded as shown in fig 9(b). also locate the points of contra flexure. **(8.5)**

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