Code.No: R05010302   R05   SET-1

I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO ME, MCT, AE)

Time: 3hours   **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks
- - -

1.a)   State and explain the Parallelogram law or forces. From this, derive the triangle and polygonal laws of forces.
  b)   The resultant of two forces, one of which is double the other is 260N. If the direction of the larger force is reversed and the other remains unchanged, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between them.   [16]

2.a)   The efficiency of a screw jack will be maximum for raising a load W, if $\alpha = 45^0 - \dfrac{\varphi}{2}$. Derive an expression for the above condition, and prove that the maximum efficiency is given by: $\eta_{max} = \dfrac{1 - \sin\varphi}{1 + \sin\varphi}$.
  b)   A body of weight 100 N is at rest on a horizontal plane. A horizontal force of 70 N just causes the body to slide. Determine the limiting force of friction and the coefficient of friction.   [16]

3.a)   Distinguish between slip and creep in a belt drive and derive the condition for maximum power transmitted by a belt drive from one pulley to another.
  b)   Two parallel shafts 12 m apart are to be connected by a belt running over two pulleys of diameters 480 cm and 80 cm respectively. Determine the length of the belt required if the belt is crossed.   [16]

4.a)   State and prove Pappus theorem I.
  b)   Determine the C.G. of a square pyramid having side of base 'a' and height *h*.
                                                                        [16]

5.a)   State and prove the parallel axis theorem.
  b)   A semicircle of radius *r* is cut from a circle of radius R. The base of the semicircle coincides with a diameter of the circle, and its centre is located at the centre of the circle. Calculate the polar moment of inertia of the remaining figure about the centre of the circle.   [16]

6.a)   Show that the angular velocity of every point on a link in a general plane motion is the same, and hence show that the angular velocity refers to the entire link rather than for any point on the link.
  b)   A stone is dropped from the top of a tower. During the last second of its flight, it is found to fall $1/4^{th}$ of the whole height of the tower. Find the height of the tower. What is the velocity with which the stone hits the ground?   [16]

1

7.a) Two rigid bodies of weights W_1 and W_2 are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle θ to each other. Derive the work energy equation for the system.

b) Find the power required to pull a train up an incline of 1 in 200 at a speed of 36kmph, if the weight of the train is 3000 kN and the track resistance is 5 N/kN. Also determine the maximum speed with which the train moves up on incline of 1 in 100 with the same power. [16]

8.a) Differentiate between angular frequency and cyclic frequency.

b) Find the period for small oscillations if a rod of length L and mass M is suspended from a point L/4 from one end. [16]

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Code.No: R05010302 | R05 | SET-2

I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO ME, MCT, AE)

Time: 3hours   **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks
- - -

1.a) Distinguish between slip and creep in a belt drive and derive the condition for maximum power transmitted by a belt drive from one pulley to another.
  b) Two parallel shafts 12 m apart are to be connected by a belt running over two pulleys of diameters 480 cm and 80 cm respectively. Determine the length of the belt required if the belt is crossed.   [16]

2.a) State and prove Pappus theorem I.
  b) Determine the C.G. of a square pyramid having side of base 'a' and height h.   [16]

3.a) State and prove the parallel axis theorem.
  b) A semicircle of radius r is cut from a circle of radius R. The base of the semicircle coincides with a diameter of the circle, and its centre is located at the centre of the circle. Calculate the polar moment of inertia of the remaining figure about the centre of the circle.   [16]

4.a) Show that the angular velocity of every point on a link in a general plane motion is the same, and hence show that the angular velocity refers to the entire link rather than for any point on the link.
  b) A stone is dropped from the top of a tower. During the last second of its flight, it is found to fall $1/4^{th}$ of the whole height of the tower. Find the height of the tower. What is the velocity with which the stone hits the ground?   [16]

5.a) Two rigid bodies of weights W_1 and W_2 are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle θ to each other. Derive the work energy equation for the system.
  b) Find the power required to pull a train up an incline of 1 in 200 at a speed of 36kmph, if the weight of the train is 3000 kN and the track resistance is 5 N/kN. Also determine the maximum speed with which the train moves up on incline of 1 in 100 with the same power.   [16]

6.a) Differentiate between angular frequency and cyclic frequency.
  b) Find the period for small oscillations if a rod of length L and mass M is suspended from a point L/4 from one end.   [16]

7.a) State and explain the Parallelogram law or forces. From this, derive the triangle and polygonal laws of forces.
  b) The resultant of two forces, one of which is double the other is 260N. If the direction of the larger force is reversed and the other remains unchanged, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between them.   [16]

3

8.a) The efficiency of a screw jack will be maximum for raising a load W, if $\alpha = 45^0 - \dfrac{\varphi}{2}$. Derive an expression for the above condition, and prove that the maximum efficiency is given by: $\eta_{\max} = \dfrac{1 - \sin\varphi}{1 + \sin\varphi}$.

b) A body of weight 100 N is at rest on a horizontal plane. A horizontal force of 70 N just causes the body to slide. Determine the limiting force of friction and the coefficient of friction. [16]

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4

Code.No: R05010302   R05   SET-3

I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO ME, MCT, AE)

Time: 3hours   **Max.Marks:80**
Answer any FIVE questions
All questions carry equal marks
- - -

1.a) State and prove the parallel axis theorem.

b) A semicircle of radius r is cut from a circle of radius R. The base of the semicircle coincides with a diameter of the circle, and its centre is located at the centre of the circle. Calculate the polar moment of inertia of the remaining figure about the centre of the circle. [16]

2.a) Show that the angular velocity of every point on a link in a general plane motion is the same, and hence show that the angular velocity refers to the entire link rather than for any point on the link.

b) A stone is dropped from the top of a tower. During the last second of its flight, it is found to fall $1/4^{th}$ of the whole height of the tower. Find the height of the tower. What is the velocity with which the stone hits the ground? [16]

3.a) Two rigid bodies of weights W_1 and W_2 are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle θ to each other. Derive the work energy equation for the system.

b) Find the power required to pull a train up an incline of 1 in 200 at a speed of 36kmph, if the weight of the train is 3000 kN and the track resistance is 5 N/kN. Also determine the maximum speed with which the train moves up on incline of 1 in 100 with the same power. [16]

4.a) Differentiate between angular frequency and cyclic frequency.

b) Find the period for small oscillations if a rod of length L and mass M is suspended from a point L/4 from one end. [16]

5.a) State and explain the Parallelogram law or forces. From this, derive the triangle and polygonal laws of forces.

b) The resultant of two forces, one of which is double the other is 260N. If the direction of the larger force is reversed and the other remains unchanged, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between them. [16]

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b) A body of weight 100 N is at rest on a horizontal plane. A horizontal force of 70 N just causes the body to slide. Determine the limiting force of friction and the coefficient of friction. [16]

5

7.a) Distinguish between slip and creep in a belt drive and derive the condition for maximum power transmitted by a belt drive from one pulley to another.

b) Two parallel shafts 12 m apart are to be connected by a belt running over two pulleys of diameters 480 cm and 80 cm respectively. Determine the length of the belt required if the belt is crossed. [16]

8.a) State and prove Pappus theorem I.

b) Determine the C.G. of a square pyramid having side of base 'a' and height h.

[16]

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Code.No: R05010302 | R05 | SET-4

I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO ME, MCT, AE)

Time: 3hours   Max.Marks:80

Answer any FIVE questions
All questions carry equal marks
- - -

1.a) Two rigid bodies of weights W_1 and W_2 are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle θ to each other. Derive the work energy equation for the system.

  b) Find the power required to pull a train up an incline of 1 in 200 at a speed of 36kmph, if the weight of the train is 3000 kN and the track resistance is 5 N/kN. Also determine the maximum speed with which the train moves up on incline of 1 in 100 with the same power.   [16]

2.a) Differentiate between angular frequency and cyclic frequency.

  b) Find the period for small oscillations if a rod of length L and mass M is suspended from a point L/4 from one end.   [16]

3.a) State and explain the Parallelogram law or forces. From this, derive the triangle and polygonal laws of forces.

  b) The resultant of two forces, one of which is double the other is 260N. If the direction of the larger force is reversed and the other remains unchanged, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between them.   [16]

4.a) The efficiency of a screw jack will be maximum for raising a load W, if $\alpha = 45^0 - \dfrac{\varphi}{2}$. Derive an expression for the above condition, and prove that the maximum efficiency is given by: $\eta_{max} = \dfrac{1 - \sin\varphi}{1 + \sin\varphi}$.

  b) A body of weight 100 N is at rest on a horizontal plane. A horizontal force of 70 N just causes the body to slide. Determine the limiting force of friction and the coefficient of friction.   [16]

5.a) Distinguish between slip and creep in a belt drive and derive the condition for maximum power transmitted by a belt drive from one pulley to another.

  b) Two parallel shafts 12 m apart are to be connected by a belt running over two pulleys of diameters 480 cm and 80 cm respectively. Determine the length of the belt required if the belt is crossed.   [16]

6.a) State and prove Pappus theorem I.

  b) Determine the C.G. of a square pyramid having side of base 'a' and height *h*.
                                                                           [16]

7

7.a) State and prove the parallel axis theorem.

b) A semicircle of radius r is cut from a circle of radius R. The base of the semicircle coincides with a diameter of the circle, and its centre is located at the centre of the circle. Calculate the polar moment of inertia of the remaining figure about the centre of the circle. [16]

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b) A stone is dropped from the top of a tower. During the last second of its flight, it is found to fall $1/4^{th}$ of the whole height of the tower. Find the height of the tower. What is the velocity with which the stone hits the ground? [16]

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