Code No: R05320304 **R05** **Set No. 2**

**III B.Tech II Semester Examinations,December 2010**
**DYNAMICS OF MACHINERY**
**Common to Mechanical Engineering, Mechatronics, Production Engineering, Automobile Engineering**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Describe with neat sketch the fottinger torsion dynamometer.
   (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [6+10]

2. (a) Define and explain the super position theorem as applicable to a system of forces acting on a mechanism.
   (b) A horizontal axle AB 150cms long is pivoted at its centre. It carries a weight of 50N at B & a rotor weighing 80N at A. The rotor rotates at 1500 rpm in clockwise direction looking from the front. Calculate the angular velocity of precision taking the radius of gyration of the rotor to be 45cms. [4+12]

3. The firing order of a six cylinder vertical four stroke in line engine is 1-4-2-6-3-5. The piston stroke is 80 mm and the length of each connecting rod is 180mm . The pitch distances between the cylinder centre lines 80 mm , 80 mm, 120 mm ,80 mm, and 80 mm respectively . The reciprocating mass per cylinder is 1.2 kg and the engine speed is 2400 rpm . Determine the out of balance primary and secondary forces and couples on the engine taking a plane midway between the cylinder 3 and 4 as the reference plane. [16]

4. (a) What is a wedge and where is it used? What is a self-locking wedge mechanism?
   (b) The shaft of a collar thrust bearing rotates at 200 r.p.m. and carries an end thrust of 100kN.The outer and the inner diameters of the bearing are 480 mm and 280 mm respectively. If the power lost in friction is not to exceed 8 kW, determine the coefficient of friction of the lubricant of the bearing. [6+10]

5. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.5cm, 4cm and 3.8cm respectively from the axis of rotation. The masses 1, 3 and 4 are 7 kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 42cm and between 1 and 3 is 16cm. The masses 1 and 3 are at right angles to each other. Find for complete balance.
   (a) The angles between the masses 1, 2 and 4.

(b) Axial distance between the planes of rotation of 3 and 4.

(c) The magnitude of mass 2. [16]

6. A Hartnell governor rotates about a vertical axis. The two rotating masses weigh10N each and move at a radius of 12cm when the speed is 550rpm. At this speed the arms 10cm, 7.5cm effective length are respectively vertical and horizontal. The equilibrium speed is 575rpm when the rotating masses are at their maximum radius of 14.5cm. Determine the stiffness rate of the spring and the compression of the spring at 550rpm. [16]

7. The weight of an electric motor is 125kg and it runs at 1500rpm. The armature weighs 35kg and its centre of gravity lies 0.05cm for axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one eleventh of the impressed force. Assume that the weight of the motor is equally distributed among the five springs.
Determine

(a) Stiffness of each spring

(b) Dynamic force transmitted to the base at the operating. [16]

8. A gas engine has a bore of 12 cm and a stroke of 24 cm and runs at 300 rpm the connecting rod is 5 times the crank and weighs 600 N and has a radius of gyration of 16 cm about the centre of gravity which is 20 cm from the crank pin center determine the magnitude and direction of the inertia force on the rod and the corresponding torque on the crank shaft when the crank has moved to 135 degrees from the inner dead center. [16]

⋆⋆⋆⋆⋆

Code No: R05320304 **R05** **Set No. 4**

**III B.Tech II Semester Examinations,December 2010**
**DYNAMICS OF MACHINERY**
**Common to Mechanical Engineering, Mechatronics, Production Engineering, Automobile Engineering**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. A gas engine has a bore of 12 cm and a stroke of 24 cm and runs at 300 rpm the connecting rod is 5 times the crank and weighs 600 N and has a radius of gyration of 16 cm about the centre of gravity which is 20 cm from the crank pin center determine the magnitude and direction of the inertia force on the rod and the corresponding torque on the crank shaft when the crank has moved to 135 degrees from the inner dead center. [16]

2. (a) Define and explain the super position theorem as applicable to a system of forces acting on a mechanism.
   (b) A horizontal axle AB 150cms long is pivoted at its centre. It carries a weight of 50N at B & a rotor weighing 80N at A. The rotor rotates at 1500 rpm in clockwise direction looking from the front. Calculate the angular velocity of precision taking the radius of gyration of the rotor to be 45cms. [4+12]

3. The weight of an electric motor is 125kg and it runs at 1500rpm. The armature weighs 35kg and its centre of gravity lies 0.05cm for axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one eleventh of the impressed force. Assume that the weight of the motor is equally distributed among the five springs.
   Determine
   (a) Stiffness of each spring
   (b) Dynamic force transmitted to the base at the operating. [16]

4. (a) Describe with neat sketch the fottinger torsion dynamometer.
   (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [6+10]

5. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.5cm, 4cm and 3.8cm respectively from the axis of rotation. The masses 1, 3 and 4 are 7 kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 42cm and between 1 and 3 is 16cm. The masses 1 and 3 are at right angles to each other. Find for complete balance.

(a) The angles between the masses 1, 2 and 4.

(b) Axial distance between the planes of rotation of 3 and 4.

(c) The magnitude of mass 2. [16]

6. A Hartnell governor rotates about a vertical axis. The two rotating masses weigh10N each and move at a radius of 12cm when the speed is 550rpm. At this speed the arms 10cm, 7.5cm effective length are respectively vertical and horizontal. The equilibrium speed is 575rpm when the rotating masses are at their maximum radius of 14.5cm. Determine the stiffness rate of the spring and the compression of the spring at 550rpm. [16]

7. The firing order of a six cylinder vertical four stroke in line engine is 1-4-2-6-3-5. The piston stroke is 80 mm and the length of each connecting rod is 180mm . The pitch distances between the cylinder centre lines 80 mm , 80 mm, 120 mm ,80 mm, and 80 mm respectively . The reciprocating mass per cylinder is 1.2 kg and the engine speed is 2400 rpm . Determine the out of balance primary and secondary forces and couples on the engine taking a plane midway between the cylinder 3 and 4 as the reference plane. [16]

8. (a) What is a wedge and where is it used? What is a self-locking wedge mechanism?

(b) The shaft of a collar thrust bearing rotates at 200 r.p.m. and carries an end thrust of 100kN.The outer and the inner diameters of the bearing are 480 mm and 280 mm respectively. If the power lost in friction is not to exceed 8 kW, determine the coefficient of friction of the lubricant of the bearing. [6+10]

⋆⋆⋆⋆⋆

Code No: R05320304 **R05** **Set No. 1**

**III B.Tech II Semester Examinations,December 2010**
**DYNAMICS OF MACHINERY**
**Common to Mechanical Engineering, Mechatronics, Production Engineering, Automobile Engineering**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. The firing order of a six cylinder vertical four stroke in line engine is 1-4-2-6-3-5. The piston stroke is 80 mm and the length of each connecting rod is 180mm . The pitch distances between the cylinder centre lines 80 mm , 80 mm, 120 mm ,80 mm, and 80 mm respectively . The reciprocating mass per cylinder is 1.2 kg and the engine speed is 2400 rpm . Determine the out of balance primary and secondary forces and couples on the engine taking a plane midway between the cylinder 3 and 4 as the reference plane. [16]

2. (a) Define and explain the super position theorem as applicable to a system of forces acting on a mechanism.
   (b) A horizontal axle AB 150cms long is pivoted at its centre. It carries a weight of 50N at B & a rotor weighing 80N at A. The rotor rotates at 1500 rpm in clockwise direction looking from the front. Calculate the angular velocity of precision taking the radius of gyration of the rotor to be 45cms. [4+12]

3. (a) What is a wedge and where is it used? What is a self-locking wedge mechanism?
   (b) The shaft of a collar thrust bearing rotates at 200 r.p.m. and carries an end thrust of 100kN.The outer and the inner diameters of the bearing are 480 mm and 280 mm respectively. If the power lost in friction is not to exceed 8 kW, determine the coefficient of friction of the lubricant of the bearing. [6+10]

4. The weight of an electric motor is 125kg and it runs at 1500rpm. The armature weighs 35kg and its centre of gravity lies 0.05cm for axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one eleventh of the impressed force. Assume that the weight of the motor is equally distributed among the five springs.
   Determine
   (a) Stiffness of each spring
   (b) Dynamic force transmitted to the base at the operating. [16]

5. A Hartnell governor rotates about a vertical axis. The two rotating masses weigh10N each and move at a radius of 12cm when the speed is 550rpm. At this speed the arms 10cm, 7.5cm effective length are respectively vertical and horizontal. The equilibrium speed is 575rpm when the rotating masses are at their maximum radius of 14.5cm. Determine the stiffness rate of the spring and the compression of the spring at 550rpm. [16]

6. (a) Describe with neat sketch the fottinger torsion dynamometer.

   (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [6+10]

7. A gas engine has a bore of 12 cm and a stroke of 24 cm and runs at 300 rpm the connecting rod is 5 times the crank and weighs 600 N and has a radius of gyration of 16 cm about the centre of gravity which is 20 cm from the crank pin center determine the magnitude and direction of the inertia force on the rod and the corresponding torque on the crank shaft when the crank has moved to 135 degrees from the inner dead center. [16]

8. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.5cm, 4cm and 3.8cm respectively from the axis of rotation. The masses 1, 3 and 4 are 7 kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 42cm and between 1 and 3 is 16cm. The masses 1 and 3 are at right angles to each other. Find for complete balance.

   (a) The angles between the masses 1, 2 and 4.

   (b) Axial distance between the planes of rotation of 3 and 4.

   (c) The magnitude of mass 2. [16]

⋆⋆⋆⋆⋆

Code No: R05320304 **R05** **Set No. 3**

**III B.Tech II Semester Examinations,December 2010**
**DYNAMICS OF MACHINERY**
**Common to Mechanical Engineering, Mechatronics, Production Engineering, Automobile Engineering**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Define and explain the super position theorem as applicable to a system of forces acting on a mechanism.
   (b) A horizontal axle AB 150cms long is pivoted at its centre. It carries a weight of 50N at B & a rotor weighing 80N at A. The rotor rotates at 1500 rpm in clockwise direction looking from the front. Calculate the angular velocity of precision taking the radius of gyration of the rotor to be 45cms. [4+12]

2. (a) Describe with neat sketch the fottinger torsion dynamometer.
   (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [6+10]

3. (a) What is a wedge and where is it used? What is a self-locking wedge mechanism?
   (b) The shaft of a collar thrust bearing rotates at 200 r.p.m. and carries an end thrust of 100kN.The outer and the inner diameters of the bearing are 480 mm and 280 mm respectively. If the power lost in friction is not to exceed 8 kW, determine the coefficient of friction of the lubricant of the bearing. [6+10]

4. The firing order of a six cylinder vertical four stroke in line engine is 1-4-2-6-3-5. The piston stroke is 80 mm and the length of each connecting rod is 180mm . The pitch distances between the cylinder centre lines 80 mm , 80 mm, 120 mm ,80 mm, and 80 mm respectively . The reciprocating mass per cylinder is 1.2 kg and the engine speed is 2400 rpm . Determine the out of balance primary and secondary forces and couples on the engine taking a plane midway between the cylinder 3 and 4 as the reference plane. [16]

5. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 3cm, 3.5cm, 4cm and 3.8cm respectively from the axis of rotation. The masses 1, 3 and 4 are 7 kg, 8kg and 5kg respectively. The axial distances between 2 and 3 is 42cm and between 1 and 3 is 16cm. The masses 1 and 3 are at right angles to each other. Find for complete balance.
   (a) The angles between the masses 1, 2 and 4.

(b) Axial distance between the planes of rotation of 3 and 4.

(c) The magnitude of mass 2. [16]

6. A Hartnell governor rotates about a vertical axis. The two rotating masses weigh10N each and move at a radius of 12cm when the speed is 550rpm. At this speed the arms 10cm, 7.5cm effective length are respectively vertical and horizontal. The equilibrium speed is 575rpm when the rotating masses are at their maximum radius of 14.5cm. Determine the stiffness rate of the spring and the compression of the spring at 550rpm. [16]

7. The weight of an electric motor is 125kg and it runs at 1500rpm. The armature weighs 35kg and its centre of gravity lies 0.05cm for axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one eleventh of the impressed force. Assume that the weight of the motor is equally distributed among the five springs.
Determine

(a) Stiffness of each spring

(b) Dynamic force transmitted to the base at the operating. [16]

8. A gas engine has a bore of 12 cm and a stroke of 24 cm and runs at 300 rpm the connecting rod is 5 times the crank and weighs 600 N and has a radius of gyration of 16 cm about the centre of gravity which is 20 cm from the crank pin center determine the magnitude and direction of the inertia force on the rod and the corresponding torque on the crank shaft when the crank has moved to 135 degrees from the inner dead center. [16]

⋆⋆⋆⋆⋆