

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem. - V - Examination – June- 2011****Subject code: 152504****Subject Name: Dynamics of Machines & Production Engineering Drawing****Date: 27/06/2011****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) A shaft supported in bearings 2m apart and projects 0.5m beyond bearings at each end. The shaft carries three pulleys one at each end and one at the middle of its length. The mass of end pulleys is 50kg and 22 kg and their centre of gravity are 16mm and 13mm respectively from the shaft axis. The centre pulley has a mass of 58 kg and its centre of gravity is 16mm from the shaft axis. If the pulleys are arranged so as to give static balance, determine: (i) relative angular positions of the pulleys, and (ii) dynamic forces produced on the bearings when the shaft rotates at 350 rpm. **07**
- (b) Derive an expression for the Natural Frequency of free longitudinal vibrations by equilibrium method. **07**

- Q.2** (a) Draw “Top Plan” by the same method of projection. Refer Figure (i). **07**
- (b) Discuss Velocity and Acceleration analysis of Piston. **07**

OR

- (b) The following data refer to a two cylinder uncoupled locomotive: **07**
- Rotating mass per cylinder = 300 kg
Reciprocating mass per cylinder = 330 kg
Distance between the wheels = 1.4m
Distance between the cylinder centers = 0.6m
Diameter of treads of the driving wheels = 1.8m
Crank radius = 0.3m
Radius of centre of balance mass = 0.6m
Speed of locomotive = 45 km/h
Angle between the cylinder cranks = 90°
Dead load of each wheel = 40kN
Determine: (i) the balance mass required in the planes of driving wheels, if the complete revolving and 2/3rd of the reciprocating masses are to be balanced, (ii) swaying couple and (iii) variation in tractive effort.

- Q.3** (a) Explain the ‘direct and reverse crank method’ for determining unbalanced forces in radial engine. **07**

- (b) A machine of mass 100 kg is mounted on springs and is fitted with a dashpot to damp out vibrations. There are three springs each of stiffness 10 N/mm and it is found that the amplitude of vibration diminishes from 38mm to 6mm in two complete oscillations. Assuming that the damping force varies as the velocity, determine: (i) the resistance of the dashpot at unit velocity, (ii) the ratio of the frequency of the damped vibration to the frequency of the undamped vibration and (iii) the periodic time of the damped vibration. **07**

OR

- Q.3 (a)** Derive an expression for the frequency of free torsional vibrations for a shaft fixed at one end and carrying a load on the free end. **07**

- (b) Four masses A, B, C, and D are completely balanced. Masses C and D makes angles of 90° and 195° respectively with B in the same sense. The rotating masses have following properties: **07**

$$m_b = 25 \text{ kg} \quad r_a = 150 \text{ mm}$$

$$m_c = 40 \text{ kg} \quad r_b = 200 \text{ mm}$$

$$m_d = 35 \text{ kg} \quad r_c = 100 \text{ mm}$$

$$r_d = 180 \text{ mm}$$

Planes B and C are 250mm apart. Determine:

- (i) the mass A and its angular position and
- (ii) the positions of planes A and D.

- Q.4 (a)** The shaft shown in figure (ii) carries two masses. The mass a is 300 kg with radius of gyration of 0.75 m and mass B is 500 kg with radius of gyration of 0.9 m. determine the frequency of the torsional vibrations. It is desired to have the node at the mid-section of the shaft of 120 mm diameter by changing the diameter of the section having a 90 mm diameter. What will be the new diameter? **07**

Take $G = 84 \times 10^9 \text{ N/m}^2$.

- (b) Draw 'L.H.side view' by the 3rd angle projection system. Refer figure (iii). **07**

OR

- Q.4 (a)** A cylinder, diameter of base 65 mm and height 110 mm is resting on H.P. on its base. A square prism, side of base 36 mm, intersects the axis of cylinder at an angle of 60° . The faces of the square prism are equally inclined to H.P. and V.P. both. Draw three projections of the cylinder and prism showing on them the line of intersection. **07**

- Q.4 (b)** Draw forms of welded joints with their sectional representations and appropriate symbols.(any seven) **07**

- Q.5 (a)** Enlist the various types of nuts you know and draw their freehand sketches inserting proportionate dimensions. **07**

- (b) A cone, diameter of base 62 mm and height 58 mm, is resting on ground on its base. A cylinder of 40 mm diameter is intersecting the cone. The axis of the cylinder intersects the axis of the cone at a point 14 mm above the base. Axis of the cylinder is inclined to H.P. by 30° and it is parallel to V.P. Draw the plan, elevation and auxiliary plan on A.I.P. parallel to the base of the cylinder. **07**

OR

- Q.5** (a) Give sequence of preparing assembly drawing with suitable example. **07**
 (b) Draw freehand sketches of following foundation bolts with proportionate dimensions: **04**
 (i) Lewis foundation bolt.
 (ii) Rag foundation bolt.
 (c) Draw freehand sketches of the following keys: **03**
 (i) Woodruff key, (ii) Feather key and (iii) Gib headed sunk key

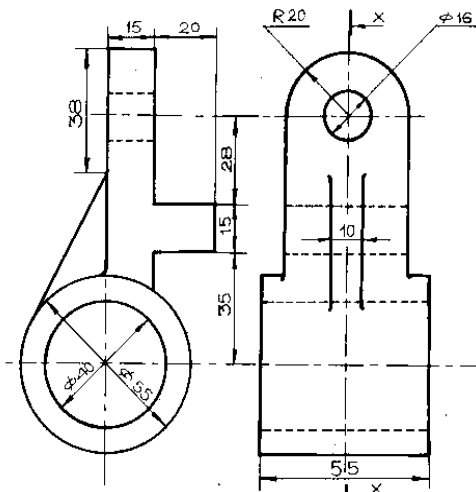


Figure (i) Q. 2 (a)

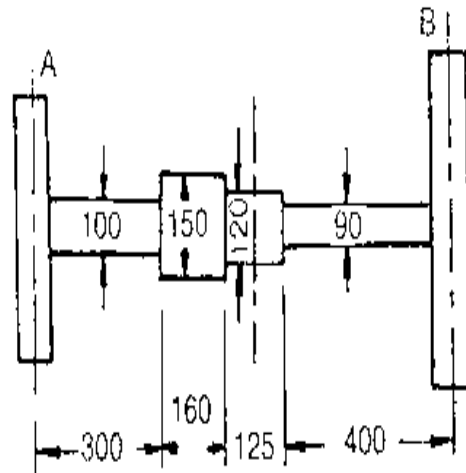


Figure (ii) Q. 4 (a)

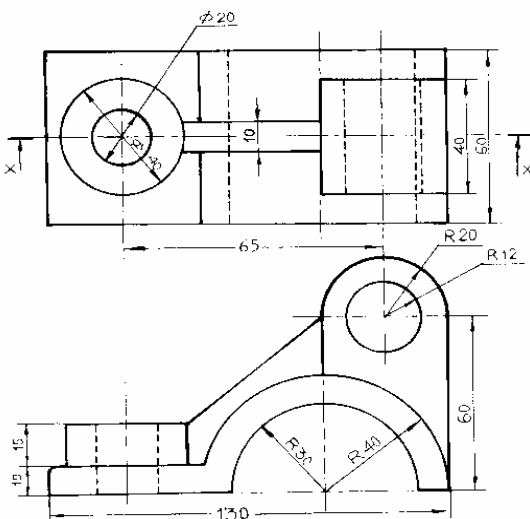


Figure (iii) Q.4 (b)

Note: All dimensions are in mm
