

**GUJARAT TECHNOLOGICAL UNIVERSITY****B.E. Sem-V<sup>th</sup> Examination December 2010****Subject code: 152504****Subject Name: Dynamics of Machines & Production Engg. Drawing****Date: 18 /12 /2010****Time: 03.00 pm - 05.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use answer-book for theoretical & drawing sheet for graphical solutions & Engg. Drawing answers.

- Q.1 (a)** The following data refer to a horizontal engine: **07**  
 Mass of reciprocating parts = 250 kg, Difference between the driving & back pressures when crank has traveled through  $60^\circ$  from inner dead center =  $0.35 \text{ N/mm}^2$ , The length of crank = 300 mm, Connecting rod Length between Centers = 1200 mm, Diameter of cylinder = 500 mm, Speed = 250 r.p.m.  
 For the given position, determine analytically:  
 (i) Reaction on guide bar or slider (ii) Thrust in the connecting rod  
 (iii) Tangential force on crank pin.
- (b)** Explain the terms: 'Fluctuation of speed' & 'Fluctuation of energy' in the context of flywheel. Derive the equation for energy stored in the flywheel using usual notations. **07**
- Q.2 (a)** The crank & connecting rod of a reciprocating engine are 200 mm & 700 mm respectively. The crank rotates in clockwise direction at 120 rad/s. Find with the help of Klein's Construction the following when the crank is at  $30^\circ$  to I.D.C.: **07**  
 (i) Velocity & Acceleration of the piston  
 (ii) Velocity & Acceleration of mid-point of the connecting rod.
- (b)** The spacing of the four cylinders A,B,C and D of a vertical Inline engine is 650 mm, 500 mm and 650 mm. The reciprocating masses of the inner cylinders B and C are 80 kg & their cranks are at  $60^\circ$  to each other; the stroke is 325 mm; their connecting rods are 600 mm long. Determine the magnitude of the reciprocating masses for the outer cylinders A and D & the relative angular positions of all the cranks if all primary forces & couples are to be balanced. Use graphical method of solution. **07**

**OR**

- (b)** An inside cylinder uncoupled locomotive has its cylinder center lines 800 mm apart & has a stroke of 600 mm. The rotating masses per cylinder are equivalent to 150 kg at the crank pin and the reciprocating masses per cylinder are equivalent to 160 kg. The wheel center lines are 1600 mm apart. The cranks are at right angle. The whole of the rotating &  $\frac{3}{4}$ <sup>th</sup> of the reciprocating masses are to be balanced by masses placed at a radius of 600 mm in the planes of wheels. Find the magnitude & direction of the balancing masses required. Crank speed is 300r.p.m. Also find variation in tractive effort. Use graphical method of solution. **07**
- Q.3 (a)** Derive the equation of motion & so equation for circular frequency for the single degree of freedom system shown in Fig.1, where  $I_o$  = moment of inertia of pulley,  $R$  = radius of larger pulley,  $r$  = radius of smaller pulley,  $m$  = mass suspended to string,  $K$  = stiffness of the spring. **07**

- (b) In a single degree damped vibrating system, a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine the (i) stiffness of the spring (ii) logarithmic decrement (iii) damping factor & (iv) damping coefficient. 07

OR

- Q.3** (a) Derive the equation for radius of gyration by 'Bifilar Suspension Method' with usual notations & neat sketch. 07
- (b) Two rotors are attached to the ends of the shaft 1200 mm long as shown in Fig. 2. Mass & Radius of gyration of rotor A is 250 kg and 50 mm respectively and that of rotor B are 600 kg and 25 mm respectively. Assuming  $G = 0.8 \times 10^5$  MPa, find: 07
- Position of node on equivalent shaft of  $\phi 50$  mm.
  - Natural frequency of torsional vibration.

- Q.4** (a) A vertical square prism, base 50 mm side and height 90 mm has a face inclined at  $30^\circ$  to the V.P. It is completely penetrated by another square prism, base 40 mm side and axis 100 mm long, faces of which are equally inclined to the V.P. The axes of the two prisms are parallel to the V.P. and bisect each other at right angles. Draw the projections showing lines of intersection. 07
- (b) Write the steps/sequence of preparing assembly drawing. Differentiate between 'Detail Drawing' & 'Assembly Drawing'. 07

OR

- Q.4** (a) Draw missing lines, full or dotted, in the orthographic views of two objects, shown in Fig.3 and indicate them by the letters M.L. Support your answer by freehand sketches of the isometric views of the objects, without which, no credit will be given for the answer. 07
- Also sketch 3 welding symbols & 3 surface roughness symbols with their meaning.
- (b) Draw at least six different types of bolts which prevent the rotation of bolt itself. What is a stud-bolt? Explain with neat sketch of it. 07

- Q.5** (a) Draw sketches of Peg key, Double headed key, Taper pin key and Parallel sunk key shown in mounted condition in the shaft & state their uses. 07
- (b) Fig. 4 shows two views of an object. Including Top view draw, 07
- Sectional front view (Section along AA)
  - Left hand side view of the object.

OR

- Q.5** (a) Draw neat sketches of Rag Foundation Bolt & Cotter Foundation Bolt with labeling of all parts of the bolts. 07
- (b) Name various types of nuts & draw sketches of each of them with their proportions shown on them. 07

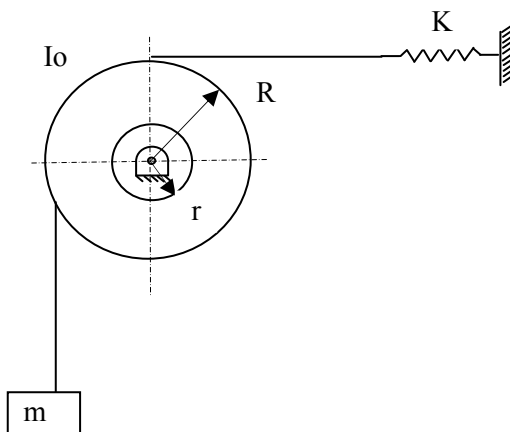


Fig. 1[Q-3(a)]

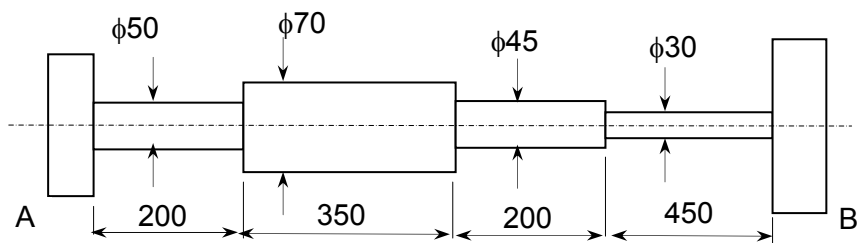


Fig. 2: ALL DIMENSIONS ARE IN mm [Q-3(b) OR ]

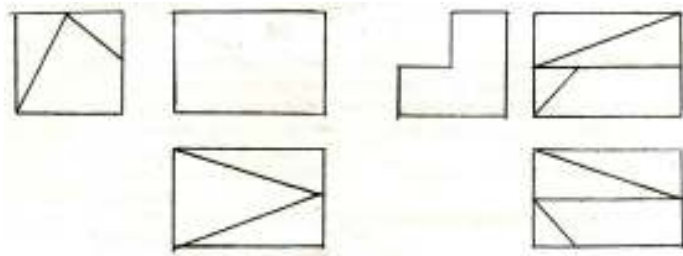


Fig. 3: [Q-4(a)]

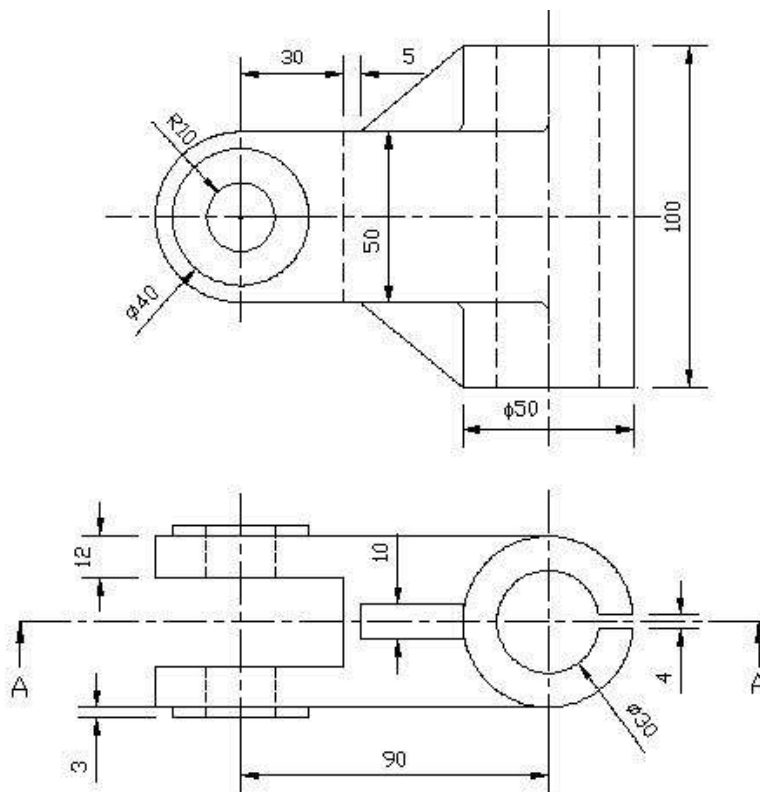


Fig. 4: ALL DIMENSIONS ARE IN mm [Q-5(b) OR ]