No. of Printed Pages : **5+Drawing Sheet** **BME-020**

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING
(COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination 02139

June, 2012

BME-020 : KINEMATICS & DYNAMICS OF MECHANISMS

Time : 3 hours *Maximum Marks : **70***

Note : *Answer **any five** of the following questions.*
*Use of non programmable **scientific** calculator is allowed.*

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1. (a) What do you understand by the terms cam and follower ? Name the essential members of a cam mechanism. **4+10**

(b) A porter governor has equal arms each 200 mm in length and pivoted on the axis of rotation. The mass of each ball is 4 kg and mass of sleeve is 20kg. The radius of rotation of the ball is 100 mm when the governor begins to lift. If the fractional increase of speed is 1% then determine the governor effort and power of the governor.

2. (a) Define and explain the term 'Balancing of Rotating Masses'. What will be the harm if the rotating parts of a high speed engine are not properly balanced ? **6+8**

(b) A single - cylinder reciprocating engine has the following data :

Speed of engine = 120 rpm; stroke = 320mm; mass of reciprocating parts = 45kg; and mass of revolving parts = 35 kg at crank radius. If 60% of the reciprocating parts and all the revolving parts are to be balanced then find :

(i) the balance mass required at a radius of 300mm.

(ii) the unbalanced force when the crank has rotated **60°** from top dead centre.

3. (a) What do you mean by gear train ? Mention the different types of the gear train. Explain the term train value. How is it related to velocity ratio ? **6+8**

(b) Determine the number of teeth and speed of the driver if the driver gear has 60 teeth of 8mm module and rotates at 240 rpm. The two spur gears have a velocity ratio of 1/4. Also calculate the pitch line velocities.

4. (a) Derive the expression for optimum speed of flat belt drive for the transmission of maximum power considering the effect of centrifugal tension. **6+8**

(b) A shaft running at 200 rpm is to drive a parallel shaft at 300 rpm. The pulley on the driving shaft is 60cm diameter. Calculate the diameter of the pulley on the driven shaft:

(i) Neglecting belt thickness,

(ii) Taking belt thickness into account, which is 5 mm thick,

(iii) Assuming in the latter case a total slip of 4%

5. (a) What is machine ? With the help of suitable examples differentiate between a machine and structure. In what way a mechanism differs from a machine ? **7+7**

(b) Explain different kinds of kinematic pairs. Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain ?

6. (a) Define rubbing velocity at a point joint. What will be the rubbing velocity at pin joint when the two links move in the same and opposite directions ? **4**

(b) The mechanism of a wrapping machine, as shown in figure 1 has the following dimensions : **10**

$O_1A = 100$ mm; $AC = 700$ mm;

$BC = 200$ mm; $O_3C = 200$ mm;

$O_2E = 400$ mm; $O_2D = 200$ mm; &

$BD = 150$ mm

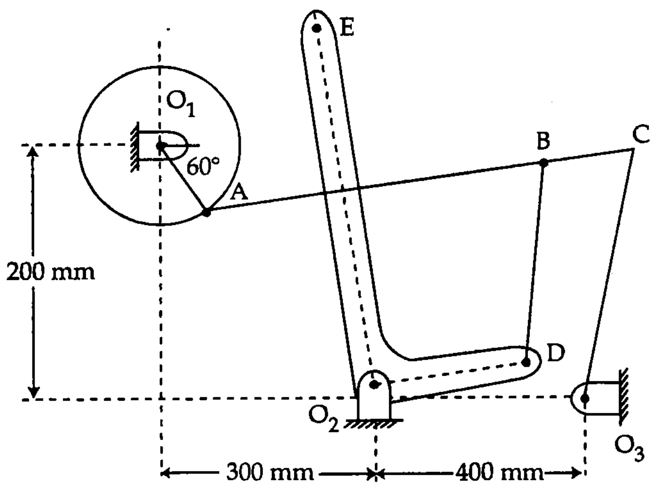

Figure - 1

The crank O_1A rotates at a uniform speed of 100 rad/s. Find the velocity of the point E on the bell crank lever by instantaneous centre method.

7. (a) Define free vibrations and forced vibrations with neat sketch. What do you understand by damped vibrations ? **6**

(b) A shaft 60mm diameter and 3 metres long is simply supported at the ends and carries three vertical loads 1100N, 1600N and 800N at 1m, 2m and 2.5m from the left support. The young's modulus of elasticity for shaft material is 200 GN/m^2. Find the frequency of transverse vibration. **8**

8. Write short notes on *any four* of following : **$3\frac{1}{2}$x4=14**

(a) Inversions of single slider crank chain

(b) Coriolis component of acceleration

(c) Law of gearing

(d) Coefficient of insensitiveness of governors

(e) Degree of freedom

(f) Balancing of in - line engines and radial engines.