

SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

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Total number of pages: {02}

Total number of questions: 09

B.Tech. ME 3<sup>rd</sup> Sem  
**Theory of Machine-I**  
Subject Code: ME 203  
Paper ID:

May 2018  
Reappear.  
2010 Batch students  
only.

Batch: 2004 onwards/2011 onwards/2015 onwards [Tick Relevant]

Time allowed: 3 Hrs

Max Marks: 60

**Important Instructions:**

- Section A is compulsory
- Attempt any four questions from section B
- Attempt any two questions from section C
- Assume any missing data, only if necessary.

**PART A (2×10)**

Q. 1. Answer in brief:

- (a) How coriolis component of acceleration in a mechanism is determined?
- (b) What is application of a pantograph?
- (c) What is the criterion for selection of material for a belt?
- (d) What is creep? How it affects the power transmission in belt drive?
- (e) What do you mean by fluctuation of energy? How it can be controlled?
- (f) How the concept of friction and wear is related to bearing or a clutch?
- (g) How the function of a governor differs from a flywheel?
- (h) What is application of tangent cam?
- (i) How will you define the terms pressure angle and trace point?
- (j) What is function of a dynamometer?

**PART B (5×4)**

- Q. 2. How will you differentiate whitworth quick return mechanism from crank and slotted lever mechanism? List the various differences with the help of neat sketch?
- Q. 3. What is a steering gear mechanism? What are its types? Which steering gear mechanism is preferred and Why?
- Q. 4. A Porter governor has all arms 250 mm long. The upper arms are attached on the axis of rotation and lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and sleeve has a mass of 50 kg. The extreme radii of the rotation are 150 mm and 200 mm. Make the calculations for determination of the range of



speed for the governor.

- Q. 5. What are various methods of the power transmission? Discuss their relative merits and demerits.
- Q. 6. A Simple band brake is applied to a rotating drum of diameter 500 mm. The angle of lap of the band on the drum is  $270^\circ$ . One end of the band is attached to the fulcrum pin of the lever and other end to a pin 100 mm from the fulcrum. If the coefficient of friction is 0.25 and a braking torque of 90 N is applied at a distance of 600 mm from the fulcrum. What will be the braking torque when drum rotates in anticlockwise direction?

### PART C (10×2)

- Q. 7. An engine runs at a constant load at a speed of 480 rpm. The crank effort diagram has to be drawn to a scale of 1 cm = 2000 N-m torque and 1 cm =  $36^\circ$  crank angle. The areas above and below the mean torque line are measured in  $\text{cm}^2$  units and are in the following order:

+1.1, -1.32, +1.53, -1.66, +1.97, -1.62

- a) What will be maximum fluctuation of energy?
- b) Design the flywheel if total fluctuation of speed is not to exceed 10 rpm and centrifugal stress in the rim is not to exceed  $5 \times 10^6 \text{ N/m}^2$

It may be assumed that the rim breadth is approximately 2.5 times the rim thickness and 90 % of moment of inertia is due to the rim. The density of the material of flywheel is  $7250 \text{ kg/m}^3$ .

- Q. 8. a) What is effect of centrifugal tension on the power transmission of a belt drive? Derive the expression for ratio of tensions on tight side and slack side for a flat belt drive?
- b) An open belt drive is required to transmit 10 kW of power from a motor running at 600 rpm. The diameter of driving pulley is 250 mm. The speed of driven pulley is 220 rpm. The belt is 12 mm thick and has a mass density of  $0.001 \text{ g/mm}^3$ . The safe stress in the belt is not to exceed  $2.5 \text{ N/mm}^2$ . The distance between two shafts is 1.25 m and coefficient of friction is 0.25. Determine the width of belt considering the effect of centrifugal tension.

- Q. 9. A cam is to be designed to provide the follower motion to a knife edged follower:

- Outstroke during  $60^\circ$  of cam rotation,
- Dwell for the next  $30^\circ$  of cam rotation,
- Return stroke during next  $90^\circ$  of cam rotation and
- Dwell for the remaining  $180^\circ$  of cam rotation.

The stroke of the follower is 40 mm and minimum radius of the cam is 50 mm. The follower moves with SHM during both outstroke and return strokes. Draw the profile of the cam, When:

- Axis of follower passes through the axis of the cam shaft
- Axis of the follower is offset by 20 mm from the axis of the cam shaft.