

Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME / AE / IE-2008/09 Batch) (Sem.-3rd)

THEORY OF MACHINES-I

Subject Code : ME-203

Paper ID : [A0802]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Answer briefly :**

- (a) What is a kinematic chain ?
- (b) Define simple and compound mechanisms.
- (c) What is law of belting ?
- (d) State the Kennedy' theorem of instantaneous centres.
- (e) Explain the term initial tension in belts.
- (f) What is the difference between brake and dynamometer ?
- (g) What is the difference between governor and flywheel ?
- (h) Explain why cycloidal motion of follower is useful for high speed engines?
- (i) Explain the term power of governor.
- (j) Explain why about 90% mass of flywheel is conserved in its rims?

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[N-(S-2) 7A]

SECTION-B

2. A shaft has a number of collars integral with it. The diameter of each collar is 400 mm and the shaft diameter is 50 mm. The intensity of pressure is $35 \times 10^4 \text{ N/m}^2$ and the coefficient of friction is 0.05, estimate :
 - (a) Power absorbed in overcoming friction at 1500 r.p.m. and carries a load of $15 \times 10^4 \text{ N}$
 - (b) Number of collars required
3. The ratio between the width of the front and rear springs of a steering mechanism is 0.44. At the instant the front wheel is turned by 18° , what should be the angle turned by the rear wheel for perfect steering ?
4. A rope pulley is designed to transmit 100 kW at a speed of 120 rpm. The angle of contact between the rope and the smaller pulley is 170° . Coefficient of friction is 0.2. Mass of the rope is 55 kg/m and the weight is limited to 125 kN , where C = circumference.
 - (a) Initial tension, and
 - (b) diameter of the pulley
5. A punching machine having a stroke of 100 mm operates once every 10 second in a 1 cm steel plate. The machine does 600 N-m of work per square cm of area. The linear speed of the flywheel rim is not to exceed 10 m/s. Suggest a suitable flywheel if this speed is not to fall below 100 rpm.
6. Refer to figure-1 where crank OA rotates with a constant angular velocity of 1000 rpm. Determine the velocity of the slider A and the angular velocity of the link AB.

BC = 18 cm
FC = 25 cm
OA = 7.5 cm
EB = 27 cm
EF = 6 cm
LEFC = 90°



[N-(S-2) 7A]

SECTION-C

7. Figure-2 shows a four bar mechanism. Find the angular acceleration of CD and linear acceleration of point R. Given :

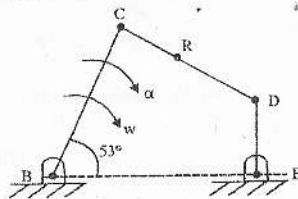
$$\alpha = 4400 \text{ rad/sec}^2$$

$$\omega = 100 \text{ rad/sec}$$

$$BC = 75 \text{ mm}, CD = 80 \text{ mm}$$

$$BE = 125 \text{ mm}, DE = 37 \text{ mm}$$

$$CR = 28 \text{ mm}$$



8. The exhaust valve of a gas engine opens 55° before outer dead centre and closes 15° after inner dead centre. A cam operates this valve. The minimum radius and lift of cam are 4.0 cm and 1.5 cm respectively. Valve opens with constant acceleration and retardation, acceleration being twice the retardation. Period for closing the valve is the same as for opening. The follower returns with S.H.M. Draw the profile of cam if the roller radius is 1.5 cm and offset is 1.0 cm to the right of cam centre.
9. For a spring controlled Hartnell type governor, following data is provided:
- mass of the governor ball = 1.80 kg
 - length of the vertical bell crank lever = 8.75 cm
 - length of other arm of bell crank lever = 10.0 cm
- The speeds corresponding to radii of rotations of 12 cm and 13 cm are 296 and 304 r.p.m. respectively. Find the stiffness of spring.