

Roll No.

Total No. of Questions : 09]

[Total No. of Pages : 03

B. Tech. (Sem. – 3rd)
THEORY OF MACHINES - I
SUBJECT CODE : ME - 203
Paper ID : [A0802]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section – A

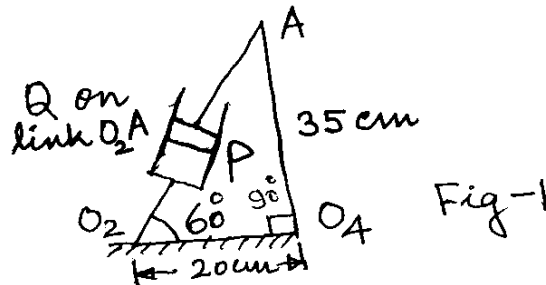
(10 × 2 = 20)

- Q1)** a) What is the difference between machine and mechanism?
- b) Show all the possible directions of coriolis acceleration depending upon the direction of sliding and angular velocity.
- c) What is the difference between Crank and slotted lever and Whitworth quick return mechanism with respect to fixing of links?
- d) What is the advantage of double universal joint over single universal joint?
- e) Why is cycloidal motion of follower preferred for high speed engines?
- f) What is creep in case of belts?
- g) What is the difference between brakes and dynamometers?
- h) Fly wheel is used in engines as well as punching press. What is the difference of working in both cases.
- i) Which governor is used in gramophones?
- j) In case of diesel engines the governor manipulates the fuel pump to regulate the fuel supply. What happens in case of petrol engine to control/regulate the fuel supply.

Section - B

(4 × 5 = 20)

- Q2)** Fig-1 shows a mechanism in which the hydraulic actuator O_2A is expanding at a constant rate of 10cm/sec. Determine the directions and magnitudes of angular velocity and acceleration of link O_4A .



- Q3)** Two shafts connected by a Hooke's joint have their axes inclined at 20° . The driving shaft rotates at 1500 r.p.m. and the driven shaft carries a flywheel of mass 15kg and radius of gyration of 10 cm. Find the maximum torque in the driven shaft if it is assumed that the shafts are torsionally rigid.
- Q4)** A motor drives a main shaft by means of a flat belt. The diameters of the pulleys on the motor shaft and main shaft are 450 mm and 750 mm respectively. Another pulley of diameter 500 mm drives a counter shaft having a diameter of 700 mm. The pulley of diameter 500 mm is mounted on the main shaft. If the slip on each drive is 3 percent, calculate the speed of counter shaft if motor runs at 1400 r.p.m.
- Q5)** The flywheel of a steam engine has a radius of gyration of 1m and mass 2500 kg. The starting torque of steam engine is 1500 N-m and may be assumed constant. Determine :
- Angular acceleration of the flywheel.
 - The kinetic energy of flywheel after 10 seconds from the start.
- Q6)** In a belt transmission dynamometer the distance between the centre of driving pulley and the dead weights is one metre. Find the value of dead weights required to keep the lever in horizontal position if power transmitted is 7.5kW and the diameter of each of the driving as well as the intermediate pulleys is equal to 400 mm. The driving pulley runs at 400 r.p.m.

Section - C

(2 × 10 = 20)

- Q7)** In a Wilson-Hartnell type of governor, the mass of each ball is 5 kg. The lengths of the ball arm and the sleeve arm of each bell crank lever are 100 mm and 80 mm respectively. The stiffness of each of the two springs attached directly to the balls is 0.4N/mm. The lever for the auxiliary spring is pivoted at its midpoint. When the radius of rotation is 100 mm, the equilibrium speed is 200 r.p.m. If the sleeve is lifted by 8 mm for an increase of speed of 6%, find the required stiffness of the auxiliary spring.
- Q8)** A reciprocating roller follower has cycloidal motion and its stroke of 30mm is completed in 90° of the cam rotation. The follower is offset against the direction of rotation by 6.25mm and radius of the roller is 12.5 mm. Determine the base circle radius which would limit the pressure angle to 30°.
- Q9)** In a quick return motion mechanism of crank and slotted lever type, the ratio of maximum velocities is 2. If the length of stroke is 25cm, find
- (a) The length of the slotted lever.
 - (b) The ratio of times of cutting and return strokes and
 - (c) The maximum cutting velocity per second if the crank rotates at 30 r.p.m.

