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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME)/(AE)
B.Tech.(IE)(2008-2009 Batch) (Sem.-3)

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. Write briefly :**

- a) Explain the principle of inversion.
- b) What is the difference between machine and mechanism?
- c) What is the difference between governor and flywheel?
- d) Write two dis-similarities between Davis and Ackerman steering mechanism.
- e) Why angle of contact is taken on smaller pulley while transmitting power by it?
- f) Mention the case when cycloidal motion of follower is preferred.
- g) What is stability of governor?
- h) Why the 90% mass of flywheel is conserved in the rims?
- i) What is the function of clutch?
- j) How many turning pairs are there in a scotch-yoke mechanism?

SECTION-B

2. Name various inversions of single slider crank chain. Explain any one.
3. In a four bar chain ABCD, AD is fixed and is 120 mm long. The crank AB is 30 mm long and rotates at 100 *r.p.m.* Clockwise while the link CD = 60 mm oscillates about D. Find the angular velocity of link CD when angle BAD = 60°. BC = AD.
4. In a Hooke's joint connecting a pair of shafts the angle between the axes of shafts is 22½°. The power supplied to the driving shaft is 8 kW and uniform speed of the driving shaft is 300 *r.p.m.* If the output torque on the driven shaft is not to exceed 30% of the input torque, what is the necessary radius of gyration of flywheel of 40 kg mass?
5. A belt 100 mm wide and 10 mm thick is transmitting power at 1000 m/min. The net driving tension is 1.8 times the tension on slack side. If the safe permissible stress on the belt section is 1.6 N/mm², calculate the max. power that can be transmitted at this speed. Assume density of the leader as 1 Mg/m³. Calculate the absolute max. power that can be transmitted by this belt and the speed at which this can be transmitted.
6. An offset translating roller follower is driven by a cycloidal motion cam rotating at 600 *r.p.m.* The max. follower rise is 3 cm during 150° of cam rotation. If the amount of offset is 0.5 cm, the pressure angle 14° for the offset follower at a cam angle of 60°, find the prime circle radius.

SECTION-C

7. A torsion dynamometer is fitted to a propeller shaft of a marine engine. It is found that the shaft twists 2° in length of 20 meters at 120 *r.p.m.* If the shaft is hollow with 40 cm external diameter and 30 cm internal diameter, find the power of the engine. Modulus of rigidity of shaft = 8×10^{10} N/m².
8. A punching press is driven by a constant torque electric motor. The press is provided with a flywheel that rotates at maximum speed of 225 *r.p.m.* The radius of gyration of flywheel is 0.5 m. The press punches 720 holes per hour; each punching operation takes 2 seconds and requires 15 kN-m of energy. Find the power of the motor and the minimum mass of flywheel if speed of the same is not to fall below 200 *r.p.m.*
9. In a Hartnell type governor the two masses are 4 kg each and the load on the sleeve is 40N. If with the weight arms vertical, the path radius is 8 cm and the equilibrium speed neglecting friction 420 *r.p.m.*; find the corresponding compression force in the spring. Find also the friction force at the sleeve which can be overcome in this position for an increase in speed of 1%. If the sleeve movement is to be 1 cm for increase in speed of 5% from the 420 *r.p.m.* position, find the required spring stiffness, if gravity effect on the masses is neglected.