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Total No. of Questions : 09]

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Paper ID [A0802]

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B.Tech. (Sem. - 3rd)

THEORY OF MACHINES - I (ME - 203)

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

Q1) *(10 × 2 = 20)*

a) Explain the Kennedy's theorem as applied to instantaneous center method.

b) What is Coriolis acceleration write its expression?

c) Explain hunting of the governor.

d) What are the desirable properties of the friction material used disc clutch.

e) Draw Davis steering mechanism for straight drive.

f) What is the use of turning moment diagram in a machine?

g) How the dynamometers are classified? Draw any one type of dynamometer.

h) Draw a neat sketch of a general cam profile and define the different terms related to the cam and indicate them on the profile drawn.

i) Draw turning moment diagram for a reciprocating machine.

j) What is the difference between front and rear wheel braking?

Section - B

(4 × 5 = 20)

Q2) Derive the expressions for the stresses in the flywheel rim and arm.

Q3) Explain the working of multiplate clutch with neat sketch.

Q4) In a rope pulley system, diameters of the driven and the driver pulleys are same and it is transmitting 80 kW power. The groove angle of the pulley is 44^0 and diameter of the rope is 25 mm. The rope can withstand a safe pull of 1350 N and one meter length of rope has a mass of 1.0 kg. The system is operating at 250 RPM. Considering that the conditions of maximum power prevail, calculate the following:

(a) Required diameters of the pulleys.

(b) Number of ropes required to accomplish the job.

Take value of μ as 0.22.

Q5) A disc cam is to give SHM to a knife edge follower during out stroke of 50 mm. The angle of ascent is 120^0, dwell 60^0, and angle of descent 90^0. The minimum radius of the cam is 50 mm. Draw the profile of the cam when

(a) The axis of the follower passes through the axis of the cam shaft, and

(b) When it is offset by 20 mm.

Q6) The Otto cycle engine develops 45kW at 180 rpm with 90 explosions per minute. The change of speed from the commencement to the end of power stroke must not exceed 0.5% of mean on either side. Find the mean diameter of the flywheel and rim cross-section having width four times the thickness so that the hoop stress does not exceed 3.5 MPa. Assume that the flywheel stores 6% more energy than the energy stored by the rim and the work done during power stroke is 1.4 times the work done during the cycle. Take density of rim material to be 7300 kg/m^3.

Section - C

(2 × 10 = 20)

Q7) A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The outside and inside diameters of the contact surfaces are 240 and 120 mm respectively. Assuming uniform wear and coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 rpm.

Q8) The two shafts are connected by the Hook's joint. The driving shaft rotates at a uniform speed of 1200 rpm. The angle between the shafts is 15^0. Calculate the maximum and minimum speeds of the driven shaft. When the acceleration of the driven shaft is maximum.

Q9) In a spring controlled governor of the Hartung type, the lengths of the horizontal and vertical arms of the bell crank lever are 120 mm and 90 mm respectively. The fulcrum of the bell crank lever is at a distance of 120 mm from the axis of rotation of the governor. Each revolving weight is 100N. The stiffness of the spring is 25N/mm. If the length of each spring is 120 mm when the radius of rotation is 75 mm and the equilibrium speed is 350 rpm, find the free length of the spring. If the radius of rotation increases to 120 mm. What will be the corresponding percentage increase in speed?