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Total No. of Pages: 03
Total No. of Questions: 09

B.Tech(IE) (Sem.3RD)
THEORY OF MACHINES-I
Subject Code: ME-203
Paper ID: [A0802]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATE:

1. SECTION-A, is Compulsory consisting of ten Sub-question carrying Two marks each
2. Attempt any four questions from SECTION-B.
3. Attempt any Two questions from SECTION-C.

SECTION-A**(10x2=20)****Q.1.** Write briefly :-

- (a) What is a machine ?
- (b) Name two inversions of double slider crank chain.
- (c) Name two inversions of single slider crank chain.
- (d) Write the necessary conditions for coriolis acceleration to take place.
- (e) Write two differences between Ackerman and Davis steering mechanism.
- (f) Define creep in belts.
- (g) Explain why cycloidal cam are used for high speed engines.
- (h) What is the difference between brakes and dynamometers?
- (i) Define coefficient of steadiness in connection with flywheel.
- (j) Explain stability and hunting of governors.

SECTION-B**(4x5=20)**

Q2. A Hooke's joint connects two shafts axes out of line by 25° . The driving shaft runs at uniform speed of 150rpm. The driven shaft has attached a mass of 200kg at radius of gyration of 150mm. If a steady torque of 500N-m resists the rotation of the driven shaft, calculate the torque required at driving shaft when $Q=45^\circ$ and (b) Maximum angular acceleration of the driven shaft.

- Q3.** The width of belt is 15cm and the maximum tension per cm width is not to exceed 140N. The ratio of tensions on the two sides is 2.25, The diameter of the driver is 1.05m and it makes 220 rpm, Find the power that can be transmitted.
- Q4.** A single plate clutch transmits 25kw at 900rpm. The maximum pressure intensity between the plates is 85kN/m^2 . The Outer diameter of the plate is 360mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine (i) The inner diameter of the plate and (ii) The axial force to engage the clutch.
- Q5.** A Certain machine tool works intermittently. The machine is fitted with a flywheel of mass 200 kg and a radius of gyration 0.40m. It runs at a speed of 400rpm between the operations. The machine is driven continuously by a motor and each operation takes 8 seconds. When the machine is doing its work, The speed drops from 400rpm to 250rpm. Find- (A) Minimum power of the motor when there are 5 operations performed per minute, and (B) Energy expended in performing each operation.
- Q6.** Determine the time required to accelerate a counter shaft of rotating mass 500kg and radius of gyration 200mm to full speed of 250rpm from rest through a single plate clutch of internal and external radii 125mm, 200mm, taking μ as 0.30 and the spring force as 600N. Assume that only one side of clutch is effective.

SECTION-C

(2x10=20)

- Q7.** For the four-bar linkage shown in Fig-1, the angular velocity of link AB is 1 rad/ sec, The length of link CD is 1.5 times of the length of link AB. Find the angular velocity of link CD in rad/sec.

- Q8.** Explain S.H.M. of follower in terms of displacement, velocity, acceleration and jerks.
- Q9.** The fly balls of a spring loaded governor of Hartnell type running at 500 rpm have a radius of rotation of 7cm with sleeve in mid position and ball arms vertical. The ball arms length and sleeve arm length are equal. The maximum sleeve movement is 2cm with $\pm 5\%$ variation in speed. The mass of the sleeve is 6kg and friction may be assumed to be equivalent of an additional load of 25N at the sleeve. The governor effort is sufficient to overcome the friction at the sleeve by 1% change of speed at mid point. Find the mass of each ball and spring rate.

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