Exam.Code:0939
Sub. Code: 7043

1078
B.E. (Mechanical Engineering)
Third Semester
MEC-303: Theory of Machines – I

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.*

x-x-x

Q1a) Classify different types of links.
b)What is Coriolis component of acceleration
c)Define transmission angle.
d)Define coefficient of fluctuation of energy
e) What is the effect of slip and creep on velocity ratio of belt drive (10)

Part-A

Q2a)Sketch and explain any one inversion of double slider crank chain. (2)
b)What is Grubler criterion. (2)
c) State and prove Kennedy Theorem (3)
d)In a four bar chain ABCD,AD is fixed and is 15 cm long. The crank AB is 4 cm long and rotates at 120 rpm clockwise, while the link CD is 8 cm long and oscillates about D.BC and AD are of equal length. Find the angular velocity of link CD when angle BAD =60°. (3)

Q3 a)Write Freudenstein's equation. (2)
b)Synthesize a four bar linkage using Freudenstein's equation to generate the function $y=x^{1.5}$ for the interval $1 \le x \le 4$.The input crank is to start from $\theta_2=30°$ and is to have a range of 90°.Take three accuracy points. Take output crank angle from 0 ° to 90°. (8)

Q4a)The turning moment curve for an engine is represented by the equation:
$T=2000 + 950 \sin 2\theta - 570 \cos 2\theta$ kg-m where θ is the angle moved by the crank from inner dead centre. If the resisting torque is constant find:
A)Power developed by the engine
B)Moment of inertia of flywheel in kg-m^2,if total fluctuation of speed is not to exceed one percent of mean speed which is 180 rpm and
C)Angular acceleration of flywheel when the crank has turned through 45° from inner dead centre. (6)
b)Explain the procedure of static force analysis of slider crank mechanism. (4)

Part-B

Q5a)Prove that maximum efficiency of screw jack is given by:
$\eta_{max}=1-\sin\Phi/1+\sin\Phi$; where Φ=friction angle. (5)
b) A leather faced conical friction clutch has a cone angle of 30°.The intensity of normal pressure between the contact surface is not to exceed 6×10^4 N/m^2 and the breadth of conical surface is not to be greater than 1/3 of mean radius. Find the dimensions of contact surface if μ=0.20 and the clutch transmits 37 kW at 2000 rpm. (5)

P.T.O.

Q6a)Derive the relation $T_1/T_2=e^{\mu\theta}$ for flat belt drive where T_1=Tight side tension,T_2 =Slack side tension, μ=coefficient of friction between belt and pulley and θ= angle of contact of belt with the pulley. (5)

b)A V-belt of 6 cm^2 cross-section has a groove angle of 40° and an angle of lap of 150°,μ=0.10. The mass of belt per metre run is 1.2 kg. The maximum allowable stress in the belt is 850 N/cm^2.Calculate the horse power that can be transmitted at a belt speed of 30m/s. (3)

c)Classify various types of chains. (2)

Q7a)Sketch and explain the working of Bevis Gibson flash light torsion dynamometer. (3)

b)A simple band brake is operated by a lever of length 500 mm long. The brake drum has a diameter of 500 mm and the brake band embraces 5/8 of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2000 N and the coefficient of friction is 0.25,find the maximum braking torque on the drum. (4)

c)Define the following in relation to governors:A)Sensitivity
B)Stability
C)Isochronism (3)

x-x-x