Total No of Questions: [12]   **SEAT NO. :** [   ]

[Total No. of Pages : 4]

T. E. (Mechanical / Automobile) 2008 course
Theory of Machines II (Code: 302043)
May 2014 (Semester - II)
Time: 3 Hours
Max. Marks : 100

Instructions to the candidates:

(1)Answer to the TWO sections should be written in separate answer books
(2)Neat diagrams must be drawn whenever necessary.
(3)Figures to the right indicate full marks.
(4)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator
    and steam tables is allowed.
(5)Assume suitable data whenever necessary.

		SECTION-I	
Q1)	a)	Explain the following with neat sketches i)Friction circle in journal bearing ii)Friction axis of a link	[4]
	b)	Write down the expression of frictional torques of all bearings assuming uniform pressure and uniform wear theory.	[4]
	c)	A centrifugal clutch has four shoes which slide radially in a spider keyed to the driving shaft and make contact with the internal surface of a rim, keyed to the driven shaft. When the clutch is at rest, each shoe is pulled against a stop by using a spring and leave a clearance of 6 mm between the shoe and the rim. The pull force exerted by spring is 600 N. The CG of the shoe is 180 mm from the axis of the clutch. The internal diameter of the rim is 450 mm, stiffness of each spring is 50 kN/m. If the mass of each shoe is 10 kg and coefficient of friction between rim and shoe is 0.4, find the power transmitted by clutch. Take speed of shaft as 600 rpm.	[8]
		OR	
Q2)	a)	Give classifications of brake and dynamometers with suitable applications	[4]
	b)	A band brake acts on the 2/3 of circumference of drum of 500 mm diameter. It provide a breaking torque of 250 N-m, one end of the band is attached to fulcrum of the lever and other end to a pin at 100 mm from the fulcrum. If the operating force is applied at the end of lever which is 550 mm from the fulcrum. Find the operating force when drum rotates in i) clockwise direction ii) anticlockwise direction. Take coefficient of friction as 0.3.	[8]
	c)	A torsion dynamometers is fitted on turbine shaft to measure the	[4]

		angle of twist. The shaft twist 1.6^0 for a length of 8 m at 600 rpm. Diameter of shaft is 250 mm. Find the power transmitted by the turbine. Take G=80 Gpa	
Q3)	a)	Draw neat sketch of cam and follower stating the terminology and define it of any four.	[4]
	b)	Draw a profile of a cam to raise a valve with SHM through 40 mm in $1/4^{th}$ of revolution, keep it fully raised through $1/10^{th}$ of revolution. The valve remains closed during rest of revolution. Diameter of roller is 20 mm and minimum radius of cam to be 30 mm. The axis of valve rod passes through axis of cam shaft. The cam shaft rotates at 360 rpm clockwise. Determine maximum velocity and acceleration of the follower during outstroke and return stroke.	[12]
		OR	
Q4)	a)	Explain cam jump phenomenon in cam and follower. What are the possible remedies to avoid it.	[4]
	b)	Find out equation for acceleration of follower in terms of angle turned by the cam if the stroke of 0.03 m is completed in 90^0 rotation of cam angle. Assume velocity of follower at the beginning and at end of motion to be zero. Use 2-3 cam equations. Also find maximum velocity and acceleration of the follower and corresponding cam angle.	[12]
Q5)	a)	What is concept of gyroscope. Explain basic terms used in gyroscope and give its applications.	[4]
	b)	What is steering, pitching and rolling with respect to navel ship.	[3]
	c)	A rear engine automobile is travelling around the track of 110 m mean radius. Each of the four road wheels has a moment of inertia of 1.6 kg-m^2 and an effective diameter of 600 mm. The rotating parts of the engine have a moment of inertia of 0.85 kg-m^2, the engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The gear ratio, engine to back axle is 3 : 1. The vehicle has a mass of 1400 kg and its center of gravity is 450 mm above the road level. The width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle round the curve for all four wheels to maintain contact with the road surface to avoid skidding of vehicle.	[11]
		OR	
Q6)	a)	What is function of governer, give its classification and explain various terms used in governer.	[4]
	b)	Give the comparasion between porter and watt governer.	[4]
	c)	Differentiate between centrifugal and inertia governer.	[4]
	d)	Explain the following terms related to governor. 1) Sensitivity of governor 2) Isochronous governor 3) Hunting of governor.	[6]

		SECTION-II	
Q 7)	a)	State the law of gearing. Derive expression for constant angular velocity ratio between two gears.	[6]
	b)	Two 20^0 involute spur gears in mesh have a module 8 mm. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module find: i) The number of pair of teeth in contact. ii) Angle of action of pinion and gear wheel. iii) The ratio of sliding velocity to rolling velocity at the beginning of contact, at pitch point and at the end of contact.	[12]
		OR	
Q 8)	a)	What do you mean by interference and undercutting?	[6]
	b)	Compare the cycloidal and involute gear tooth profile.	[4]
	c)	Two 20^0 involute spur gear mesh externally and give a velocity ratio 3 and module is 4 mm and the addendum is equal to 1 times module. If pinion rotates at 150 rpm determine the number of pairs of teeth in contact to avoid the interference.	[8]
Q 9)	a)	Derive expression for pitch cone angles of bevel gears.	[6]
	b)	A three start worm has a pitch diameter of 80 mm and a pitch of 20 mm. It rotates at 750 r.p.m and drives a 40 teeth worm gear. If coefficient of friction is 0.06 find: i) The helix angle of worm. ii) The speed of gear. iii) The centre distance. iv) Efficiency. v) The lead angle for maximum efficiency. vi) Maximum efficiency.	[10]
		OR	
Q10)	a)	Explain helical gear force analysis with neat sketch.	[4]
	b)	A spiral gear drive is used to transmit the power from one shaft to the other shaft. The shaft angle is 90^0. The two wheels are of equal diameters with normal pitch of 9 mm. The centre distance is approximately 150 mm. The speed ratio of the drive is 2.5, Find: i) Transverse pitch of each wheel. ii) Spiral angles. iii) Number of teeth on each wheel. iv) Exact centre distance. v) Efficiency, if coefficient of friction is 0.12	[12]
Q11)	a)	Explain the inertia of geared system.	[6]
	b)	An epicyclic train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B which drives wheel D through an idle wheel C, D being concentric with A. wheels B and C are carried on an arm which revolves clockwise at 100 rpm about the axis of A and D . If the wheels B and D have 25 and 40 teeth respectively find the number of teeth on C.	[10]