Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | | |

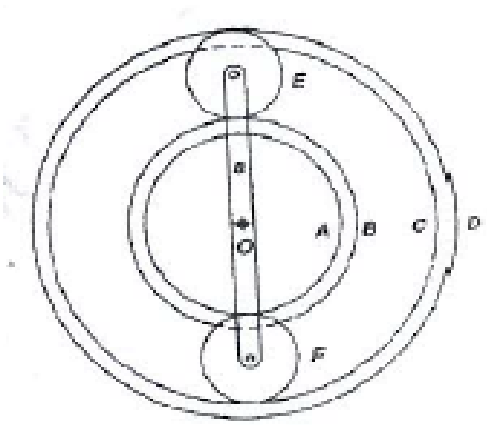
Fourth Semester B.E. Degree Examination

Subject Title Theory of Machines

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. In the sketches of mechanisms, clearly distinguish link and construction line
03.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define the following: i) Kinematic chain ii) Kinematic mechanism iii) Machine iv) Structure v) Degrees of Freedom.	**L2**	**5**
	b	Describe with neat figure two inversion of double slider-crank chain.	**L2**	**8**
	c	Explain with a neat sketch, pantograph mechanism. State its applications.	**L2**	**7**
		OR		
Q.02	a	With a neat sketch, explain the condition for correct steering for Ackermann's mechanism.	**L2**	**8**
	b	Explain the Whitworth quick return motion mechiansm, with a neat sketch.	**L2**	**8**
	c	The length of the fixed link of a crank and slotted –lever mechanism (Quick return motion) is 800mm and that of the crank is 200mm. Detemine: i) angle between extreme posiotions of slotted lever and ii) Ratio of the time of cutting stroke to that of return stroke.	**L3**	**4**
		Module-2		
Q. 03	a	State and prove law of gearing.	**L2**	**8**
	b	Two gear wheel mesh externally and are to give a velocity ratio of 3. The teeth are of involute form of module 6 mm and standard addendum one module, pressure angle is 18° and pinion rotates at 90rpm, find, (i) number of teeth on each wheel so that interference is just avoided.(ii) Length of path of contact (iii) Maximum velocity of sliding between teeth. (iv) Number of pairs of teeth in contact.	**L3**	**12**
		OR		
Q.04	a	Explain reverted type gear train with sketch	**L2**	**4**

	b	In the epicyclic gear train shown in fig. (4b), the compound wheels A and B as well as internal wheel C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to arm 'A'. All the wheels are of the same module. The number of teeth on the wheels are $T_A = 52$, $T_B = 56$, $T_E = T_F = 36$. Determine the speed of C if; (i) The wheel D fixed and arm 'A' rotates at 200 rpm in the clockwise direction (ii) The wheel D rotates at 20 rpm counter clockwise and the arm 'A' rotates at 200rpm clockwise.  Fig. 4(b)	**L3**	**16**
		Module-3		
Q. 05	a	Sketch and explain the following (i) Disc cam with translating follower (ii) Wedge cam with translating follower (iii) Cylindrical cam with oscillating follower	**L2**	**6**
	b	A cam rotating at uniform speed of 300rpm operates a reciprocating follower through a roller 1.5 cm diameter. The follower motion is defined as below; Outside during 150° with UARM, Dwell for next 30°, Return during next 120° with SHM. Remaining dwell period, Stroke of the follower is 3cm. Minimum radius of cam is 3cm. Draw the cam profile when the follower axis is offset to the left by 1 cm and determine maximum velocity and maximum acceleration during outstroke.	**L3**	**14**
		OR		
Q. 06	a	Define the terms: (i) Cam profile (ii) Base circle (iii) Prime circle (iv) Pitch curve (v) Pressure angle.	**L2**	**5**
	b	Draw the profile of a cam operating a knife edge follower having a lift of 30mm. The cam raises the follower with simple harmonic motion for 150° of the rotation followed by a period of dwell for 60°. The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform speed of 120 rpm and has a least radius of 20mm. what will be the maximum velocity and acceleration of the follower during the lift and the return?.	**L3**	**15**
		Module-4		
Q. 07	a	Explain briefly static and dynamic balancing of rotating masses.	**L2**	**6**
	b	A rotating shaft carries four masses A,B,C and D of 10 kg ,15kg, 18 kg and 20kg at radii 50mm, 60mm, 60mm, and 80 mm respectively. The masses B, C and D revolve in planes 400mm, 600mm and 800mm respectively measured from plane of mass A and are angularly located at 60^0, 145^0 and 270^0 respectively measured counter-clockwise from mass A. the shaft is dynamically balanced by two masses located at 50 mm radii and revolving in plane L and M placed midway b/w the masses A & B and midway between those of masses C & D respectively. Determine the magnitude of balance mass and their angular positions.	**L3**	**14**
		OR		

Q. 08	a	Derive an expression for ratio of tension in a flat belt drive	**L2**	**8**
	b	A 8mm thick belt is required to transmit 15 kW running over a pulley at a speed of 15 m/sec. If the coefficient of friction between the belt and pulley is 0.3 and the angle of lap is 180^0, find the width of belt required. The maximum tension in the belt material is not to exceed 20N/mm width of belt. The density of belt material is $1000Kg/m^{3.}$	**L3**	**12**
		Module-5		
Q. 09	a	With a neat sketch show the following axis of spin, axis of precession, axis of couple, planes of spin, precession and couple.	**L2**	**8**
	b	An aeroplane makes a completer half circle of 50m radius, towards left when flying at 200 km/hr. The rotary engine and the propeller of the plane have a mass 40kg with a radius of gyration of 0.30m. The engine runs at 2400rpm clockwise, when viewed from the rear. Find the gyroscopic couple on the plane and state its effect on it. What will be the effect, if the aeroplane turns to its right instead of left?	**L3**	**12**
		OR		
Q. 10	a	Explain the terms i) Governor Effort ii) Hunting iii) Governor Power	**L2**	**6**
	b	The arms of a porter governor are 300mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40mm from the axis of rotation. The mass of the load on the sleeve is 70kg and the mass of each ball is 10 kg. Determine the equilibrium speed when the radius of rotation of the ball is 200mm. If the friction is equivalent to a load of 20N at the sleeve, what will be the range of speed for this position?	**L3**	**14**

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.