Model Question Paper-1 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

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define the following: i) Kinematic link ii) Kinematic pair iii) Kinematic chain iv) Kinematic mechanism v) Machine vi) Structure vii) Inversion vii) Degrees of Freedom	**L2**	**7**
	b	Explain with a neat sketch crank and slotted lever quick return motion mechanism.	**L2**	**8**
	c	The length of the fixed link of a crank and slotted –lever mechanism (Quick return motion) is 250mm and that of the crank is 100mm. Detemine: i) angle between extreme posiotions of slotted lever and ii) Ratio of the time of cutting stroke to that of return stroke.	**L3**	**5**
		OR		
Q.02	a	With the help of a neat sketch along with proof, explain how a peaucellier mechanism generates a straight line.	**L2**	**10**
	b	Explain pawl and ratchet wheel mechanism with neat sketch.	**L2**	**10**
		Module-2		
Q. 03	a	Derive an expression for path of contact	**L2**	**8**
	b	The number of teeth on each of the two equal spur gears in mesh is 40. The teeth have 20° involute profile and the module is 6mm. If the length of arc of contact is 1.75 times the circular pitch, find the addendum.	**L3**	**12**
		OR		
Q.04	a	Sketch and explain: i) Compound gear trainii) Epicyclic gear train	**L2**	**6**
	b	An epicyclic gear train consist of a sun wheel S, a stationery internal gear 'E' and three identical planet wheels 'P' carried on a stat-shape planet carrier 'C'. The sizes of different toothed wheels are such that the planet carrier C rotates one revolution for every 5 revolutions of the sun wheel S. The minimum number of teeth on any wheel (say P) is 16. The driving torque on the sun wheels of the train is 100 N-m. Determine (i) Number of teeth on different wheels of the train (ii) Torque necessary to keep the internal gear stationery.	**L3**	**14**
		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	Construct the profile of a cam to suit the following specification: Cam shaft diameter =40mm, Least radius of cam=25mm, Diameter of roller	**L3**	**14**

		=25mm, Angle of lift=120°, Angle of fall=150°,Lift of the follower =40mm, No. of pauses are two of equal interval between motion. During the lift the motion is SHM. During the fall motion is UARM. The speed of cam shaft is uniform. The line of stroke is centre of the cam.		
Q. 06	a	Define the terms: (i) Cam profile (ii) Base circle (iii) Prime circle (iv) Pitch curve (v) Pressure angle.	**L2**	**5**
	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**	**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, which are radially attached to it along the shaft axis. The mass centres are 40mm, 50mm, 60mm and 70mm respectively from the axis of rotation. The masses B, C& D are 60kg, 50kg and 40kg respectively. The angle of masses C and D with respect to mass B are 90^0 and 210^0 in same sense respectively. The planes containing B and C are 0.5m apart, for a complete balance of the system, determine, (i) The mass and angular position of mass A (ii) The position of planes containing masses A&D.	**L3**	**14**
OR				
Q. 08	a	Derive an expression for ratio of tension in a flat belt drive	**L2**	**8**
	b	A belt drive is required to transmit power from a motor running at 900 rpm. The diameter of the driving pulley of the motor is 300mm.The driven pulley runs at 300rpm and the distance between centre of two pulleys is 3m. The width and thickness of belt are 80 mm and 10mm respectively. The density of belt material is 1000kg/$m^{3.}$ The maximum allowable stress in belt material is 2.5 Mpa. The coefficient of friction between belt and pulley is 0.3. Assume open belt drive and neglect the slip in belt drive. Determine the power transmitted by the belt drive.	**L3**	**12**
Module-5				
Q. 09	a	Derive an expression for the gyroscopic couple.	**L2**	**6**
	b	Each wheel of a motor cycle is of 600mm diameter and has a moment of inertia of 1.2 kg-m^2. The total mass of the motor cycle and rider is 180kg and the combined center of mass is 580mm above the ground level when the motor cycle is upright. The moment of inertia of the rotating parts of the engine is 0.2kg-m^2. The engine speed is 5 times the speed of the wheels and is in the same sense. Determine the angle of heel necessary when the motor cycle takes a turn of 35m radius at a speed of 54kmph.	**L3**	**14**
OR				
Q. 10	a	Explain the terms: i) Sensitivity ii) Stability iii) Isochronism	**L2**	**6**
	b	A porter governor has all four arms 300mm long, the upper arms are pivoted on axis of rotation and lower arms are attached to the sleeve at a distance 35mm from the axis. The mass of each ball is 7 kg and the load on the sleeve is 540 N. Determine the equillibium speed for two exreme radii of 200 mm and 260mm of rotation of governor balls.	**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.