A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 93A04

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Third Semester

Agricultural Engineering

19UAG304 - Fundamentals of Theory of Machines

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The lower pairs are CO1- R

   (a) self-closed (b) force closed (c) friction closed (d) none of the above

2. A kinematic chain is known as a mechanism when CO1- R

   (a) one link is fixed (b) two of the link is fixed

   (c) three link is fixed (d) none of the link is fixed

3. Which formula is used to calculate angle of static friction (Φs)? CO2- R

   (a) tan-1 μs (b) sin-1 μs (c) cos-1 μs (d) none of the above

4. When a body slides over another, the frictional force experienced by the body is known as _____ friction. CO2- R

   (a) sliding (b) rolling (c) static (d) none of the above

5. The size of a cam depends upon CO3- R

   (a) base circle (b) pitch circle (c) prime circle (d) prime curve

6. The angle between the direction of the follower motion and a normal to the pitch curve is called CO3- R

   (a) pitch angle (b) prime angle (c) base angle (d) pressure angle

7. The size of a gear is usually specified as CO4- R

   (a) pressure angle (b) circular pitch

   (c) diametral pitch (d) pitch circle diameter

8. The module of gear be m, the number of teeth T and pitch circle diameter D then — CO4- U

(a) m=D/T (b)D= T/m (c) m= D/2T (d) none of the above

9. The sensitiveness of a governor is given by — CO5- U

(a) $\frac{\omega mean}{\omega 2-\omega 1}$ (b)$\frac{\omega 2-\omega 1}{\omega mean}$ (c)$\frac{\omega 2-\omega 1}{2\ \omega mean}$ (d) none of the above

10. When the sleeve of a porter governor moves upward, the governor speed — CO5 -U

(a) increases (b) decreases (c) remains unaffected (d) moderate

PART – B (5 x 2= 10Marks)

11. Define degrees of freedom. — CO1- R

12. What are the belt materials? — CO2- U

13. What is a cam? — CO3- U

14. What is an angle of obliquity in gear? — CO4- U

15. What is the function of governors? — CO5- R

PART – C (5 x 16= 80Marks)

16. (a) State the kutzbach criterion and Grublers criterion and expalin the types of kinematic chains. — CO1- U — (16)

Or

(b) Explain in detail about the double slider crank chain and inversions with neat sketches. — CO1- U — (16)

17. (a) Explain the types of friction. — CO2 -U — (16)

Or

(b) Explain in detail about the law of friction. — CO2 -U — (16)

18. (a) Construct a tangent cam and mention the important terminologies on it — CO3- U — (16)

Or

(b) A cam is designed for a knife follower with the following data. (i) Cam lift = 40 mm during 90° of cam rotation with SHM (ii) Dwell for the next 30° (iii) During the next 60° of cam rotation, the follower returns to original position with SHM. (iv) Dwell for the reaming 180° Draw the profile of the cam when the line of stoke is offset 20 mm from the axis of the cam shaft — CO3 -E — (16)

19.	(a)	State and prove the law of gearing and thus derive the expression for "Velocity of sliding".	CO4- U	(16)
		Or		
	(b)	Two mating gears have 20 and 40 involute teeth of module 10mm and 20° pressure angle .The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half of the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio.	CO4 -E	(16)
20.	(a)	Explain the types and functions of governors.	CO5- U	(16)
		Or		
	(b)	A porter governor has equal arms each 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and mass of the central load on the sleeve is 25kg.The radius of rotation of the ball is 150mm when governor is at maximum speed. Find the maximum and minimum speed and range of speed of the governor.	CO5- E	(16)