Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec - 2016**

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| **Code :** | **09ME205/ 12ME222 / ME207 / ME254** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **MECHANICS OF MACHINES - I** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | What is a ternary joint? | (1) |
| 2. | Define inversion of a mechanism. | (1) |
| 3. | What is the condition for transmitting maximum power in a flat belt drive? | (1) |
| 4. | The velocity at any point on a rigid link with respect to any other point on the same link is \_\_\_\_\_\_\_\_\_\_\_ to the link. | (1) |
| 5. | Write any two motions of the follower. | (1) |
| 6. | What is a cylindrical cam? | (1) |
| 7. | Define addendum in a gear. | (1) |
| 8. | What is meant by a ‘gear train’? | (1) |
| 9. | What is the function of a governor? | (1) |
| 10. | What is a journal bearing? | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | Differentiate between lower pair and higher pair. | (3) |
| 12 | Discuss relative merits and demerits of belt and rope drives for transmission of power. | (3) |
| 13 | Differentiate between a reciprocating and oscillating follower. | (3) |
| 14 | Write short notes on (a) Reverted gear train and (b) Epicyclic gear train. | (3) |
| 15 | A multiple disc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surface is 240 mm and the inside diameter is 120 mm. Assume theory of uniform wear and coefficient of friction as 0.3. Find the axial force on each friction surface. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | | |
| 16. | a. | | Sketch and explain any two inversions of a four bar chain. | (8) |
| b. | | Write short notes on the types of constrained motion. | (7) |
| (OR) | | | | |
| 17. | a. | | Sketch and explain any two inversions of a single slider crank chain. | (8) |
| b. | | Determine the number of degrees of freedom for (i) Four bar mechanism (ii) Five bar mechanism and (iii) Mechanism with a higher pair. | (7) |
| 18. |  | | A shaft rotating at 200 rpm drives another shaft at 300 rpm and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4 m. The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt if it is an open belt drive. | (15) |
| (OR) | | | | |
| 19. |  | | The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm.  The crank is 150 mm and the connecting rod is 600 mm long. Determine (i) linear  velocity at mid-point of connecting rod and (ii) angular velocity of connecting rod, at  crank angle of 45º from the inner dead centre position. | (15) |
| 20. |  | | Draw the profile of a cam operating a knife-edge follower from the data given:  (a) Cam lift = 40 mm during 90° of cam rotation  (b) Dwell for the next 30°  (c) Follower to return to its initial position during 60° of cam rotation  (d) Follower to dwell for remaining 180° of cam rotation  Draw the profile of the cam when the line of stroke is offset 20 mm from the axis of the cam shaft. Outstroke and return stroke takes place with simple harmonic motion. The radius of the base circle of the cam is 40 mm. | (15) |
| (OR) | | | | |
| 21. |  | | Design a cam for operating the exhaust valve of an oil engine. It is required to give equal  uniform acceleration and retardation during opening and closing of the valve. Outstroke  takes place during 60º of cam rotation; Dwells for the next 30°; return stroke takes place  during the next 60º of cam rotation and the follower dwells for the remaining period.  The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is  provided with a roller of radius 20 mm and its line of stroke passes through the axis of  the cam. | (15) |
| 22. |  | | Two involute gears of 20º pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2; module is 5 mm. Assuming addendum equal to one module, find the angle turned through by the pinion when one pair of teeth are in mesh. | (15) |
| (OR) | | | | |
| 23. |  | An epicyclic gear train is arranged as shown in the fig. How many revolutions does the  arm, to which the pinions B and C are attached, make:  (a) when A makes one revolution clockwise and D makes half a revolution anticlockwise, and  (b) when A makes one revolution clockwise and D is stationary?  The number of teeth on gears A and D are 40 and 90 respectively. | | (15) |
| 24. |  | A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radius of frictional surface, if the coefficient of friction is 0.255; the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm2. Also determine the axial thrust to be provided by the springs. Assume the theory of uniform wear. | | (15) |
| (OR) | | | | |
| 25. |  | | A porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the maximum and minimum speeds and the range of speed of the governor. | (15) |

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