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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17ME2012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **KINEMATICS OF MACHINERY** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain various inversions of four bar mechanism with neat diagrams. | 1 | 10 |
| b. | Determine the mobility of the mechanism shown in using Kutzbach mobility criterion:  (i)    (ii) | 2 | 10 |
|  |  |  |  |  |
| **(OR)** | | | | |
| 2. | a. | Explain the following joints with neat sketches:  i) Revolute joint, ii) Prismatic joint, iii) Spherical joint,  iv) Cylindrical joint | 1 | 10 |
| b. | Sketch and explain any two inversions of a single slider crank chain. | 1 | 10 |
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| 3. |  | The crank of a slider crank mechanism rotates clockwise at a constant speed of 500 r.p.m. The crank is 100 mm and the connecting rod is 600 mm long. Determine : 1. Linear velocity and acceleration of the midpoint of the connecting rod, and 2. angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position. | 3 | 20 |
| **(OR)** | | | | |
| 4. |  | In a four bar chain ABCD, AD is fixed and is 15 cm long. The crank AB is 4 cm long and rotates at 120 r.p.m. clockwise, while the link CD = 8 cm oscillates about D. BC and AD are of equal length. Find the linear and angular velocities of links CD and BC when angle BAD = 60°. | 3 | 20 |
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| 5. | a. | Draw the cam profile for nomenclature. | CO6 | 6 |
| b. | Define the Pressure angle, lift and pitch point in cam profile. | CO6 | 6 |
| c. | Classify the types of followers and follower motions. | CO6 | 8 |
| **(OR)** | | | | |
| 6. |  | Draw the profile of a cam operating a knife-edged follower and with the following data:  Minimum radius of cam= 25 mm, lift = 30mm. The cam lifts the follower for 120° with simple harmonic motion (SHM) followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by dwell period. If the cam rotates at a uniform speed of 180 rpm in the clockwise direction, calculate the maximum velocity and acceleration during the ascent and descent of the follower. | CO6 | 20 |
|  |  |  |  |  |
| 7. | a. | What is the functional difference between spur gear and helical gear? | CO4 | 5 |
| b. | A pinion having 40 teeth drives a gear having 120 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. | CO4 | 15 |
| **(OR)** | | | | |
| 8. | a. | Differentiate between reverted and compound gear train. | CO4 | 4 |
| b. | The gearing of a machine tool is shown in Fig. a. The motor shaft is connected to gear A and rotates at 975 r.p.m. The gear wheels B, C, D and E are fixed to parallel shafts rotating together. The final gear F is fixed on the output shaft. What is the speed of gear F ? The number of teeth on each gear are as given below :  Gear A: 20 teeth; B: 50; C: 25; D: 75; E: 26; F:65 | CO4 | 16 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25 ? | CO5 | 10 |
| b. | A single plate clutch, with both sides effective, has outer and inner diameters 350 mm and 250 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 rpm. | CO5 | 10 |