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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

**End Semester Examination – April/May – 2017**

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| **Code :** | **14ME3026** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED MECHANISM DESIGN** | **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 Kutzbach criterion for the mobility of planar and spatial mechanisms. | CO1 | 6 |
| b. | Give an example where Kutzbach criterion fails. Explain Why? | CO1 | 2 |
| c. | Find the mobility of the following mechanisms  (i) (ii) | CO1 | 12 |
| (OR) | | | | |
| 2. | a. | What is Grashof’s law? Explain class I and class II kinematic chains. | CO1 | 4 |
| b. | Sketch at least four different examples of the use of four bar linkage in practice. They can be found in the workshop, in domestic appliances, on vehicles, an agricultural machine, and so on. | CO1 | 16 |
| 3. |  | A toggle clamp used to securely hold parts is shown in figure. Analytically determine the displacement of the clamp surface as the handle rotates downward 15°. | CO2 | 20 |
| (OR) | | | | |
| 4. | a. | Apply Kennedy’s rule to find the instantaneous centres of the crank-rocker mechanism shown below. | CO2 | 5 |
|  | b. | Angular velocity of crank AB is 400 r.p.m. Dimensions are given in mm. Find the velocity of point B, C and mid-point of link AB, BC and CD using instantaneous centre method. | CO2 | 15 |
| 5. | a. | Sketch the locus of a fixed centrode of a four-bar crank- rocker mechanism. | CO2 | 4 |
|  | b. | Obtain the relations for the position and angular velocity of coupler and slider of a four-bar slider-crank mechanism using vector loop closure equation. Angular velocity of crank is ω2. Slider is offset is ‘**d’** from X-axis. | CO2 | 16 |
| (OR) | | | | |
| 6. | a. | State and explain D’Alembert’s principle of dynamic equilibrium. | CO3 | 4 |
|  | b. | A four-bar mechanism is subjected to external force and torque as shown below. Determine the torque T on the input link O2A for static equilibrium. Also find the forces on the bearings O2, A, B and O4. | CO3 | 16 |
| 7. | a. | How structural error and branch defect affect the function of a mechanism? | CO3 | 4 |
|  | b. | Design a linkage to generate the function y=log10 x over the range 2≤ x≤ 3. Choose θ0 =75⁰ ,∆θ=60⁰ and φ0 =30⁰ , ∆φ=60⁰ | CO3 | 16 |
| (OR) | | | | |
| 8. | a. | Explain Chebychev spacing of precision points. | CO3 | 4 |
|  | b. | Synthesize a four-bar linkage to give the following values for the angular velocities and angular accelerations using Bloch’s method.  ω2 =190 rad/s, ω3=80 rad/s, ω4=125 rad/s,  α2=0 rad/s2 , α3=-980 rad/s2 α2 = -15000 rad/s2 | CO3 | 16 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain Denavit –Hartenberg parameters. | CO3 | 12 |
|  | b. | Discuss the topological arrangements of robotic arms. | CO3 | 8 |