**Pick and Place - Polar Machine (PPPM)**

It is required to design a pick and place system in an automated processing line for picking the workpiece from a specified location and place it in position located at same radius and 90 degrees rotation in anticlockwise sense looking from the top. The system is to wait in this position for 10 seconds to allow for the process to complete and again pick up the component, rotate by further 90 degree anticlockwise (180 degrees with respect to first pick-up location) and place the workpiece at radial extension of 15 mm for further transfer. The system then rotates back to the home position and waits for the next workpiece to arrive at first pick up location. The weight carrying capacity of the system should be minimum 3 kg. A vertical displacement of 80 mm, radial displacement of 100 mm and rotation of 180 degrees is required for the system to function.

You are required to design the mechanism for picking the workpiece from the pick up location, transfer it to the processing station, wait for 10 seconds, pick it up again and transfer it to the next location. The design should clearly provide the mechanism implemented, design calculations for strength/dimensions for each link/component and justify selection of any off-the-shelf component like bolts, bearings, bushes, motors, couplings etc. You can select the gripper/end effecter of your choice but you need to clearly specify its features and limitations.

**Submission**

1. You are required to develop at least two alternate concepts at sketch level and give complete comparison of these for selecting the better concept.
2. It is required to submit a design report including the sketches of the concepts, comparison of the concepts and justification of the best concept selected, detailed design calculations with load cases/failure assumptions, selection catalog references for the concept that is selected for detailing.
3. It is also required to submit the CAD assembly of your design.