UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech PIE | **Semester – VI**
Subject (Course): Industrial Automation and robotics | **Max. Marks : 100**
Course Code : IPEG 333 | **Duration : 3 Hrs**
No. of page/s: 2

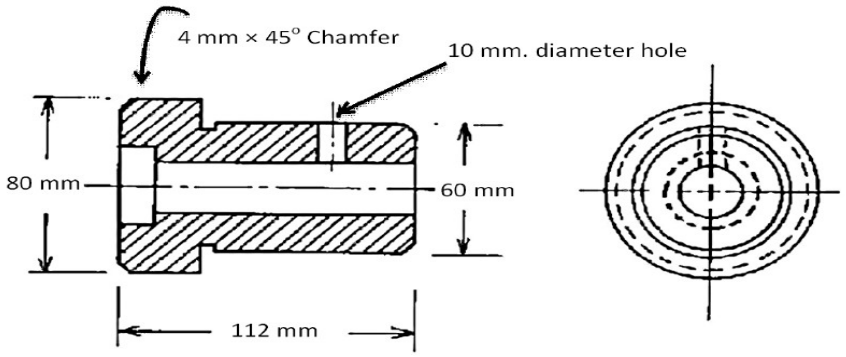
SECTION A [20 Marks]

Note: Attempt all questions. Be brief and specific.

S. No.	Content	Marks	CO
Q1.	Differentiate between Process and Discrete manufacturing industries.	5	CO3
Q2.	Explain the basic components of a robotic system.	5	CO1
Q3.	Define the following terms with respect to measuring instruments: (a) Accuracy (b) Speed of response (c) Resolution	5	CO5
Q4.	Differentiate between regulatory control and feed-forward control with block diagram.	5	CO3

SECTION B [40 Marks]

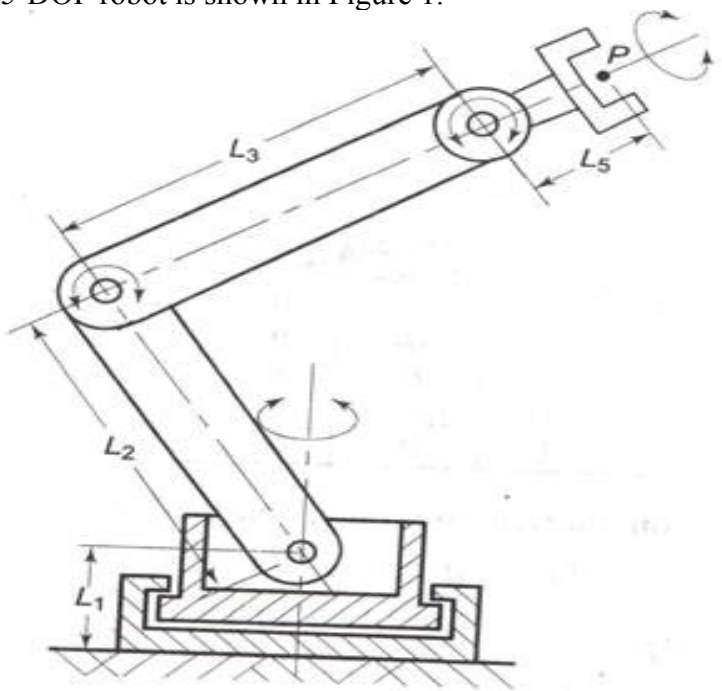
Note: Attempt all questions. All question carry equal marks. Be brief and specific.

Q5.	Write down the first five digits of the Opitz code for the part shown below: 	10	CO4
Q6.	Discuss in detail Adaptive control system and its functions with block diagram.	10	CO3
Q7.	Discuss Automation along with its various types (advantages and disadvantages).	10	CO1
Q8.	Derive the matrix that represents a pure rotation about the y-axis of the	10	CO2

	reference frame. **Or** A point P in space is defined ${}^{B}P = (5, 4, 3)^{T}$ relative to frame B which is attached to the origin of the reference frame A and is parallel to it. Apply the following transformations to frame B and find ${}^{A}P$. Also verify the results. • Rotate 90° about x-axis: then • Translate 4 units about y-axis, 5 units about z-axis, and 1 units about x-axis; then, • Rotate 90° about z-axis.		

SECTION C [40 Marks]

Note: Attempt all questions. All question carry equal marks. Be brief and specific.

Q9.	Explain in detail CMM (components, structure, operations and control, advantages). Draw appropriate sketches. **Or** Explain in detail Machine vision system (operations, types of camera, illumination techniques, and advantages). Draw the appropriate sketches.	20	CO5
Q10.	**Q1:** A 5-DOF robot is shown in Figure 1.  Figure 1: Figure for Q. 7 a) Assign coordinate frames as necessary based on D-H representation. b) Fill out the D-H parameters table. c) Find the ${}^{U}T_{H}$ matrix.	20	CO2