Total No. of Questions : 8]

SEAT No. :

P-1415

[Total No. Of Pages : 2

[6003]-532

T.E. (Robotics and Automation Engineering)

HUMANOID ROBOTS

(2019 Pattern) (Semester-II) (Elective-II) (311511(A)-II)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2 Q.3 or Q.4 Q.5 or Q.6 Q.7 or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Give significance of angular momentum and the inertia tensor in humanoid robotics **[8]**

b) How can the dynamic equations of motion be derived for a humanoid robot in 3D analysis? Explain the steps involved in the derivation process.

A humanoid robot has two feet with contact points at (0,0) and (0.2,0) in a 2D plane. The robot's center of mass is located at (0.1,0.1). Calculate the net torque around the center of mass and determine if the robot is in balance. **[10]**

OR

Q2) a) What is the Zero Moment Point (ZMP) in humanoid robotics and why is it important in measuring stability? **[8]**

b) What is the significance of 2D analysis in humanoid robotics and how does in contribute to understanding robot behaiour?

A humanoid robot has a mass of 10kg. The inertia tensor of the robot's body is given as follows: lxx=2kgm^2, lyy=3kgm^2, lzz=1kg*m^2 Calculate the total moment of inertia for the robot's body. **[10]**

Q3) a) How does the field of humanoid robotics contribute to the study and understanding of neuroscience? **[8]**

b) How can foveal vision be implemented in humanoid robots? What is cognitive human robotics and how does it integrate congnitive abilities in to robot systems? **[9]**

OR

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Q4) a) Explain foveal vision and it's important for humanoid robots. **[8]**

b) How can humanoid robots be used to emulate neuro-mechanisms and contribute to our understanding of brain function? **[9]**

Q5) a) What is multi-fingered grasping, and why is it important in robotics? Discuss some applications of multi-fingered grasping in robotics. **[8]**

b) What is multi-arm object manipulation control? State the advantages of using multiple robot arms for object manipulation **[9]**

OR

Q6) a) What are the challenges in achieving effective multi-fingered grasping in robotics? **[8]**

b) What are the challenges in controlling multiple robot arms for object manipulation? Explain the significance of cooperation between multiple humanoids in robotics. **[9]**

Q7) **Write short note on:** **[18]**

a) Search and rescue humanoid robots

b) Humanoids in sports

c) Concept of AI

OR

Q8) **Write short note on:** **[18]**

a) A.I. in Robotics

b) Service robots

c) Social Robotics