





- b) Explain the Robot programming methods in detail. (3)  
 c) Explain the RS 232 Interface in robotic system. (3)

- Q.4 a) Explain with block diagram forward and inverse kinematics. (5)  
 b) The link parameters for the manipulator are given in table. Obtain the origin of the gripper w.r.t. base frame indicating all the intermediate steps. (5)

$i$	$\alpha_{i-1}$	$a_{i-1}$	$d_i$	$\theta_i$
1	90	0	0	0
2	0	0	2	45
3	60	0	0	0

- Q.5 a) Explain artificial intelligence in robotic system stating importance of expert system. (3)  
 b) Explain the safety considerations in Robotic system. (3)  
 c) In robot kinematics a vector is represented by  $V = 5i + 3j + 8k$ . Rotate the vector by 90 degree @ x axis and then use new position for further translation of the position by 8 units along Z axis. (4)

- Q.6 a) Explain the commands used in welding applications. (3)  
 b) Which robot configuration and controller is suitable for the robot to be used in painting application. (3)  
 c) Write a program for depalletization of components from pallet to the Chute as shown in Fig.2. Use suitable assumptions if required and use interlocking commands in the program. (4)

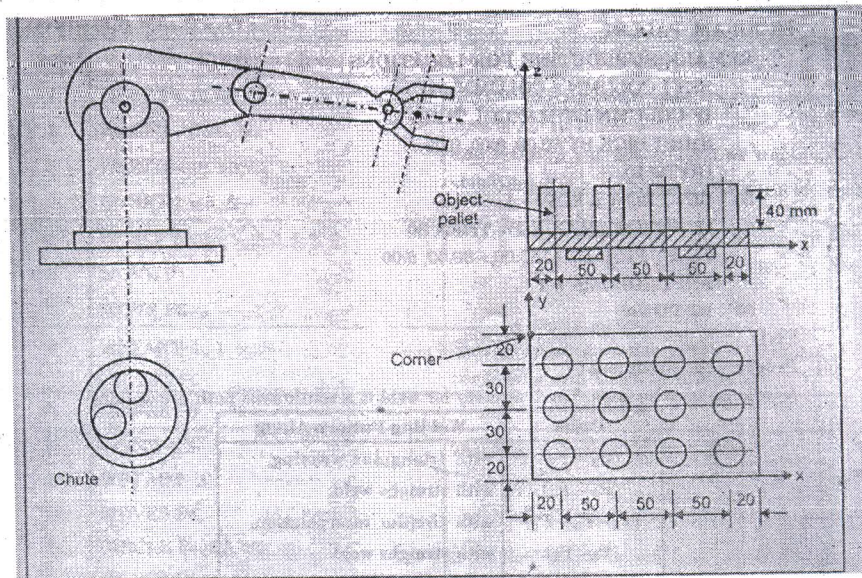


Fig. 2