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UNIVERSITY OF MORATUWA, SRI LANKA.
FACULTY OF ENGINEERING

MID-TERM EXAMINATION (Held in June 2006)
B.Sc. ENGINEERING LEVEL 2, SEMESTER 1

DE 206 – ROBOT DESIGN AND COMPETITION

Answer ALL questions in the answer sheet provided. *Time allowed: 90 minutes*

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1. The microprocessor, which runs on the Handy Board is
   a) H8 b) MC6810 c) MC [illegible] d) none of these

2. Handy board's processor word length is
   a) 4 bit b) 8 bit c) 16 bit d) 32 bit

3. Handy board's battery backed memory is
   a) 8kB b) 16kB c) 32kB d) 64kB

4. Number of ananlog, digital, and motor control ports on the handy board are
   a) 7, 9, 4 b) 9, 7, 4 c) 7, 9, 6 d) 9, 7, 6

5. Which of these is not part of Handy board
   a) dual H-Bridge IC b) IR receiver
   c) parallel interface d) analog inputs

6. The low battery LED lights up for a short time when you switch on the Handy board. This indicates that the handy board
   a) is running low battery b) is running perfectly
   c) is needed to be charged d) communication failure

7. The pull up resister of the sensor input port of the handy board is
   a) 4.7k b) 20k c) 47k d) 55k

8. To reset the handy board without running the main() function
   a) simply turn off and then turn on the handy board
   b) type reset command at the IC prompt
   c) hold down stop button while tuning on the handy board
   d) hold down start button while tuning on the handy board

9. Once the HB is synchronized with IC you type on the Host computer the following
C>1+2 What would be the outcome?
   a) 3 will be printed on the host computer
   b) 3 will be printed on the HB display
   c) An error message will be displayed on the Host computer
   c) An error message will be displayed on the handy Board display

10. In the question 10, code compilation and evaluation takes place in
   a) the handy board and host computer, respectively
   b) both in the host computer
   c) both in the handy board
   d) the host computer and HB, respectively

11. Your DC power adapter is rated for 9V/500mA. You check the output voltage without a load connected and found that it reads 14V. What is your conclusion
   a) regulator specification is wrong
   b) regulator specification is correct
   c) open circuit voltage is higher than the rated voltage
   d) it is wise not to use the regulator.

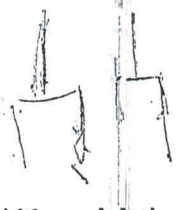
12. What would be the outcome if you use a center +ve 12V power adapter to charge the handy board battery
   a) the battery will charge slowly
   b) the battery will not charge
   c) handy board will be burnt.
   d) neither of the above

13. What would be the outcome if you apply 12V for a 9V DC motor
   a) motor will be broken.
   b) motor will not work.
   c) motor will work as normal
   d) motor will drive faster.

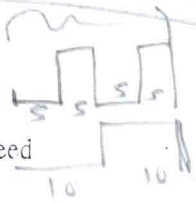
14. Can you use 3~4.5V toy motors with the handy board
   a) yes
   b) no
   c) cannot certainly say.
   d) should be possible

15. When does a motor draw maximum current
   a) when it starts.
   b) when the motion is stalled externally
   c) when it runs with maximum speed
   d) when it drives its rated load.

16. How can you drive a 9V/1A motor with the handy board
   a) piggyback another L293D H-Bridge to the motor port
   b) follow normal procedure
   c) It is not possible.
   d) parallaly connect two motor ports.



17. Pulse width modulation is used to
    a) change motor direction of motion
    b) change motor speed.
    c) turn on and turn off the motor
    d) control power.



18. When PWM frequency drops while maintaining the same duty cycle
    a) motor will slow down.
    b) motor will maintain same speed
    c) speed fluctuation increase
    d) speed fluctuation decreases

19. H-bridge is used to
    a) turn the motor ON
    b) turn the motor OFF
    c) change the direction of motion.
    d) control multiple motors

20. Which if the followings is not true in servo motors
    a) It is not a normal DC motor
    b) it has a closed loop position controller
    c) It has a built-in encoder
    d) It has a gear reduction

21. The PWM signal of a servo motor determines
    a) shaft position
    b) motor power
    c) shaft velocity
    d) none of these.

22. Can you drive a high power servo motor with the handy board
    a) no.
    b) yes
    c) yes, for a short time
    d) cannot say certainly

23. How many servo motors can handy board drive simultaneously
    a) 2 b) 3 c) 4 d) only 1

24. How can you use 9.6V battery to drive 6V servo motor
    a) do not worry about little extra voltage
    b) use a resister to drop the voltage
    c) use IN4001 diodes to drop the voltage
    d) any of theabove

25. Stepper motors are
    a) good for position control only
    b) driven by PWM
    c) good for speed control only
    d) driven by pulse streams

26. A six wire stepper motor has
    a) 3 coils
    b) 4 coils
    c) six coils
    d) cannot say certainly

27. The two-coil excitation of a stepper motor compared with single coil excitation has
    a) twice as much power
    b) twice as much torque
    c) twice as much speed
    d) none of these

28. How can you identify different coils of a stepper motor
    a) using an ohmmeter.
    b) from the manual of the motor
    c) by trial-and-error
    d) any of the above

29. Half stepping of stepper motors provides
    a) half speed
    b) half power.
    c) twice resolution
    d) twice speed

30. How many six-wire DC motors can be driver by the handy board
    a) 1 b) 2 c) 3 d) 4

31. You have connected a photosensor to analog port(0), at a certain level of ambient light, analog(0) reads 1V. What would be the resistance of the photocell at this illumination level
    a) 47kΩ/4 b) 4.7kΩ/4 c) 4.7kΩ/5 d) 4.7kΩ/5

32. Which of these is not true about digital inputs of the handy board
    a) >2.5v is logic 1
    b) they are pulled up internally
    c) operate inverted logic
    d) open switch will read 0V.

33. Which of these is not true about analog inputs of the handy board
    a) 4-bit AD conversion
    b) 8-bit AD conversion.
    c) internally pulled up
    d) voltage divider circuit.

34. A switch sensor can be used for
    a) contact sensing
    b) limit the rotation.
    c) motor speed measurement
    d) all of them

35. Which of these is true about potentiometer sensors
    a) 2-wire connection provides better functionality for higher resistances
    b) 3-wire connection provides better functionality for higher resistances
    c) both (a) and (b)
    d) none of the (a) and (b)

36. Which of these is not true about photocells and phototransistors
    a) photocells are slow responding
    b) former can be used for moving object detection
    c) only phototransisters can be used for shaft encoding
    d) both can be used as optosensors

37. Handy board's digital outputs can supply 20mA. How many low power LEDs can be driven by a single digital output pin?
    a) 1 b) 2 c) 3 d) 4

38. what is not true about qudrature shaft encoding
    a) it provides speed measurements
    b) it provides direction of motion
    c) it needs two optosensor modules
    d) it needs three optosensor modules

39. Which of these is the best method for fast data collection
    a) save data to an array
    b) send data to host computer using serial interface
    c) both of the above
    d) none of the above

40. Which of these statements is not correct about proportional control
    a) it produces control signal proportional to error
    b) for low gains, it settles with an offset error
    c) for high gains, it produces oscillation
    d) it cannot be tuned to attain zero error