SINGAPORE POLYTECHNIC

2017/2018 Semester 2 Mid semester Test

FULL MODULE NAME: Embedded Computer Systems   module no.: ET0104
Set by: Tracey Lee
Course: DCPE/DEEE   Year : 3   FT

Q No.	SOLUTION	Marks	Total
A	1 - a / 2 - a / 3 - c / 4 - d / 5 - c 6 - d / 7 - a / 8 - b / 9 - a / 10 - d	3 marks each	30
B1.a) b) c)	Processor speed / Address bus size / Data bus size / Architectural changes. Main programming changes: 1) Go into low power mode as soon as possible: standby/hibernate modes 2) Programs are just interrupts, wake up from low power. Similar answers accepted Health condition, sleep/wake times, driving habits (any 2-others possible)	4 marks 6 marks 2 marks	 12

B2.

Type of memory	Use	Reason
ROM	program messages, tables	non volatile
RAM	data, temporary store of recorded images	read/write
Flash Memory	Storage of images	non volatile, erasable
Serial EEPROM	user settings, compute history	non volatile, erasable

ROM – 4 marks
RAM – 3 marks
Flash Memory – 3 marks
Serial EEPROM – 3 marks

Total: 13

B3.

North1=0xED	North2=0xDD	North3=0xBD	North4=0x7D
South1=0xEE	South2=0xDE	South3=0xBE	South4=0x7E

8 mks

b) For 90 keys, consider L is latch, B is buffer
45*2:6L/1B, 30*3: 4L/1B, 15*6: 2L/1B, 10*9: 2L/2B ∴ 15*6 - least h/w   4 marks   12

B4. Since we need 64K, each chip is 16K, # chips needed: 64K /16K = 4
A0 to A13- (2^{14} = 16384=3FFFh. From D0000H   2 mk

              Chip 1   -   D0000H to D3FFFH   2 mks
              Chip 2   -   D4000H to D7FFFH
              Chip 3   -   D8000H to DBFFFH
              Chip 4   -   DC000H to DFFFFH

```
A19 A18 A17 A16 A15 A14 A13 - - - - - - A0
1   1   0   1   0   0   x---------------x D0000-D3FFFH
1   1   0   1   0   1   x---------------x D4000-D7FFFH
1   1   0   1   1   0   x---------------x D8000-DBFFFH
1   1   0   1   1   1   x---------------x DC000-DFFFFH
```
3 mks

A17-19 enabled by 74688

Nonvolatile, writable - Flash   2 mks

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		4 mks	13
B5. a)	Goals: Excessive water detection system - use water sensor, every minute, motor moves to detect motor - display on water level	2 mks	
	Constraints: water proof, vertical motion, battery operation (similar answers accepted)	2 mks	
b)	Sub-systems for the design: water sensor / motor / display / timer / μp	4 mks	
c)		1 mk (user) 2 mk (balloon) 1 mk 'use arrows'	

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Q No.	SOLUTION	Marks	Total
d)		3 marks (arrows) 3 marks (activities) (*other solutions possible-as long as reasonable*)	
v)	Should display on active light like LED. Definitely not LCD.!!!	2 mks	20