Reg. No.										

MAHE, MANIPAL
SCHOOL OF INFORMATION SCIENCES

THIRD SEMESTER M.Sc. Tech (EMBEDDED SYSTEMS & INSTRUMENTATION)
DEGREE EXAMINATION (Make-up) – JANUARY 2018

SUBJECT: ESI 605 – EMBEDDED SYSTEMS DESIGN

Saturday, January 6, 2018

Time: 10.00 – 13.00 Hrs. Max. Marks: 100

✍ Answer ALL the questions

Note: Each full question carries 10 marks

1. What are the design challenges in the embedded system design?

2. With the functionality block diagram explain three processor technologies, the pros and cons of each technology.

3. Four lights 0, 1, 2, 3 are connected to a decoder. Build a circuit that blinks the lights in the following order: 0, 3, 2, 1, 0, 3… Start from a state diagram, draw the state table, minimize the logic and draw the final circuit.

4. (a) Compute the memory needed to store a 16-bit digital encoding of 5-minute audio signal whose maximum frequency is 5 KHz.
   (b) It is required to measure 100 ft. of water in the water tank. Find the precision with which the level in the tank can be measured / controlled if a 12-bit ADC.

5. It is required to transmit a real-time video whose frame dimension is 1024 * 768 pixels. The picture is assumed to be black & white. The video frame rate can be assumed to be 25 frames / sec. Find (a) Sampling freq. (b) Conversion time of the ADC (C) Memory required to store 5 min video with 75 % compression.

6. Explain (a) FIFO (b) LRU (c) ORP with an example each.

7. A typical computer system has 32K main memory block and 4K fully associative cache memory block. The cache block size is 4 words. Memory access time = 10*Cache access time.
   a) What is the size of the tag field?
   b) If direct mapping is used what is the tag size?
   c) What is the access efficiency if h = 0.9?
   d) If tc = 200 nsec, calculate h, to achieve an average access time = 500 nsec.

8. Assume a main memory has 3-page frames and initially all page frames are empty. Consider the following stream of references 1,2,3,4,5,1,2,3,1,2,3,4,3,6,5
   Calculate the hit ratio if the replacement policy used is
   a) FIFO (b) LRU (c) Optimal replacement policy.

9. With an example of a digital camera discuss the different implementations possible to achieve the desired specifications (include both functional and nonfunctional specifications).

10. For the reservation table shown in fig Q.10 find the following

Fig 10

	0	1	2	3	4
S1	X				X
S2		X		X	
S3			X		X
S4				X	

(a) List of forbidden latencies (b) Collision vector (c) State diagram showing all possible latency cycles (d) List of all simple cycles (e) Minimum Average Latency (MAL)