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10CS72

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define an embedded system. Mention its characteristics. **(04 Marks)**

b. With a neat flow diagram, explain embedded system design process. **(06 Marks)**

c. Write the requirement chart of MTC and explain the sequence diagram for transmitting a control input in a model train controller. **(10 Marks)**

2 a. Differentiate between Von Neumann and Harvard architectures. **(04 Marks)**

b. What is the average memory access time of a machine whose hit rate is 93%, with a cache access time of 5ns and a main memory access time of 80ns? **(04 Marks)**

c. Explain the following terms :
i) Traps ii) Exceptions iii) Supervisor mode. **(06 Marks)**

d. Explain the format of ARM data processing instruction. **(06 Marks)**

3 a. Explain :
i) Watch dog timer ii) Requirement chart of Alarm clock. **(08 Marks)**

b. Explain the hardware architecture of a typical PC. **(06 Marks)**

c. With a neat diagram, explain bus with a DMA controller. **(06 Marks)**

4 a. Explain any two program optimization techniques with example. **(08 Marks)**

b. With a neat flow diagram, explain the process of program generation from compilation through loading. **(06 Marks)**

c. Sketch and explain the data flow graph model. **(06 Marks)**

PART – B

5 a. What is RTOS? List the different services of RTOS. **(05 Marks)**

b. What is TCB? Explain its structure. **(05 Marks)**

c. What are the factors to be considered for selection of scheduling algorithm. **(04 Marks)**

d. Explain : i) Task ii) Process iii) Thread. **(06 Marks)**

6 a. Explain the two different types of inter-process communication mechanisms. **(10 Marks)**

b. Explain the following :
i) Advanced configuration and power interface
ii) L–shaped usage distribution. **(10 Marks)**

7 a. Explain distributed embedded system? Mention its advantages. **(05 Marks)**

b. Explain the CAN data frame format. **(05 Marks)**

c. Describe the structures of : i) I^2C Bus ii) IP packet. **(10 Marks)**

8 a. Explain the different types of files generated on cross compilation **(08 Marks)**

b. Explain the advantages and limitations of simulator based debugging. **(06 Marks)**

c. Write short notes on target system and host system. **(06 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Seventh Semester B.E. Degree Examination, June/July 2017
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is an embedded system? Explain the characteristics of embedded computing applications. **(06 Marks)**

b. Write a requirement chart for GPS moving map device. **(04 Marks)**

c. Define design methodology. Explain with a neat sketch the embedded design process. **(10 Marks)**

2 a. Write a ARM assembly code for the below c- statement Z = (a << 2)| (b & 15). **(04 Marks)**

b. With a neat figure explain the ARM programming model. **(04 Marks)**

c. With a neat diagram, explain the interrupt mechanism. **(06 Marks)**

d. Define address translation. Explain address translation for segment. **(06 Marks)**

3 a. With a neat sketch, explain the bus with a DMA controller. **(06 Marks)**

b. Discuss the hardware architecture of a typical PC as a platform. **(08 Marks)**

c. Explain the working of keyboard and touch screen I/O devices. **(06 Marks)**

4 a. With a neat diagram, explain program generation from compilation through loading. **(08 Marks)**

b. Consider the following C-code statement :

```
if (a + b > 0)
    x = 5;
else x = 7;
```

i) Write CDFG for the above C statement

ii) Generate the ARM assembly code for the above C statements. **(08 Marks)**

c. Explain the different ways of measuring program performance. **(04 Marks)**

PART – B

5 a. With the figure of operating system architecture explain the different kernel services. **(10 Marks)**

b. Explain monolithic kernel and micro kernel models with necessary figures. **(06 Marks)**

c. Discuss various types of multitasking existing in the operating systems context. **(04 Marks)**

6 a. Define blocking and unblocking communications **(04 Marks)**

b. Explain shared memory communication with a neat sketch. **(08 Marks)**

c. Discuss message passing and signal interprocess communications. **(08 Marks)**

7 a. With a neat diagram, explain the distributed embedded architecture. **(06 Marks)**

b. Discuss the working of Ethernet CSMA/CD algorithm. **(08 Marks)**

c. Explain internet service stack with a neat figure. **(06 Marks)**

8 a. What is simulator? Explain the features, advantages and limitations of simulator based debugging. **(10 Marks)**

b. With a neat sketch, explain the monitor program based firmware debugging. **(10 Marks)**

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10CS72

Seventh Semester B.E. Degree Examination, May 2017
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What are the challenges in designing embedded computing systems? **(04 Marks)**

b. Enumerate the requirements and specifications of GPS moving map and explain the same. **(06 Marks)**

c. Draw the UML class diagram for the train controller and explain working of each subsystem in detail. **(10 Marks)**

2 a. What is an FIR filter? Write ARM assembly code for the FIR filter. **(10 Marks)**

b. Explain priorities and vectors with respect to interrupts. **(10 Marks)**

3 a. Explain the four cycle hand shake bus protocol. **(04 Marks)**

b. With a neat diagram, explain the DMA controller. **(08 Marks)**

c. Draw the UML state diagram for scan keyboard and explain the same. **(08 Marks)**

4 a. For the following code in C, draw the data flow graph:

$w = a + b;$
$x_1 = a - c;$
$y = x_1 + d;$
$x_2 = a + c;$
$z = y + c.$ **(04 Marks)**

b. Write about the program optimization technique in detail. **(10 Marks)**

c. Explain the operational working of software modem. **(06 Marks)**

PART – B

5 a. What is a Task Control Block (TCB)? Explain the salient features and structure of TCB. **(06 Marks)**

b. Elicit the difference between memory management of general purpose kernel and real time kernel. **(04 Marks)**

c. Explain the Round Robin (RR) process scheduling with interrupts. **(10 Marks)**

6 a. In a bus based system, how shared memory communication works? Explain in detail. **(10 Marks)**

b. Explain in detail the operational working of the telephone answering machine. **(10 Marks)**

7 a. Explain the process of communication in distributed embedded system. **(10 Marks)**

b. With a neat diagram, explain the I^2C bus. **(10 Marks)**

8 a. Explain in detail the role of integrated development environment (IDE) for embedded software development. **(10 Marks)**

b. During the cross compilation of an embedded C file what are the various files generated? Explain each of them in detail. **(10 Marks)**

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Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is Embedded system? Give one example. **(02 Marks)**

b. Explain briefly the characteristics of Embedded computing application. **(10 Marks)**

c. Write the top-down view of the embedded system design process and write a requirement chart of model train controller. **(08 Marks)**

2 a. Write ARM assembly code to implement the following C assignment.
$z = a (b + c) - d * e$ **(04 Marks)**

b. What is an interrupt priorities mechanism used to handle multiple device interrupts? **(08 Marks)**

c. What is cache? How it relates to memory system mechanism? Explain different types of cache miss. **(08 Marks)**

3 a. Explain a bus with a DMA controller mechanism? **(08 Marks)**

b. Differentiate between Random accesses memories and Read only memories. **(04 Marks)**

c. List out the I/O devices commonly used in embedded computing systems. Explain briefly any three I/O devices. **(08 Marks)**

4 a. For a give basic block, rewrite it in single assignment form and then draw the data flow graph.
$w = a + b$
$x = a - c$
$y = x + d$
$x = a + c$
$f = y + e$ **(06 Marks)**

b. Explain any two program optimization Techniques. **(08 Marks)**

c. Write a short note on alarm clocks. **(06 Marks)**

PART – B

5 a. Explain the basic function of Real time kernel. **(10 Marks)**

b. Give different between monolithic kernel and micro kernel. **(04 Marks)**

c. Define process. With a diagram, explain state transition of a process. **(06 Marks)**

6 a. What is Interprocess Communication (IPC)? Give an overview of different types of IPC mechanisms adopted by various operating systems. **(10 Marks)**

b. What is deadlock? What are the different conditions favoring deadlock? **(05 Marks)**

c. Explain the different functional requirement that needs to be evaluated in the selection of an RTOS. **(05 Marks)**

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2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

7 a. Explain the structure and characteristics of an I^2C bus. **(10 Marks)**

b. Explain Ethernet packet format. **(05 Marks)**

c. Explain the following terms :
Internet security, Internet service stack **(05 Marks)**

8 a. Explain the following interated development Environment
Simulators
Emulators
Debugger **(12 Marks)**

b. Explain the different tools used for hardware debugging. **(08 Marks)**

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Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is Embedded system? Give one example. **(02 Marks)**

b. Explain briefly the characteristics of Embedded computing application. **(10 Marks)**

c. Write the top-down view of the embedded system design process and write a requirement chart of model train controller. **(08 Marks)**

2 a. Write ARM assembly code to implement the following C assignment.
$z = a (b + c) - d * e$ **(04 Marks)**

b. What is an interrupt priorities mechanism used to handle multiple device interrupts? **(08 Marks)**

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$w = a + b$
$x = a - c$
$y = x + d$
$x = a + c$
$f = y + e$ **(06 Marks)**

b. Explain any two program optimization Techniques. **(08 Marks)**

c. Write a short note on alarm clocks. **(06 Marks)**

PART – B

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Internet security, Internet service stack **(05 Marks)**

8 a. Explain the following interated development Environment
Simulators
Emulators
Debugger **(12 Marks)**

b. Explain the different tools used for hardware debugging. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

Embedded Computing System

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is an Embedded Computing system? Mention its characteristics. **(04 Marks)**

b. Explain Embedded system Design process with respect to GPS moving map. **(10 Marks)**

c. Draw and explain the sequence diagram for transmitting a control input in a model train controller. **(06 Marks)**

2 a. Write ARM assembly code to implement the following C assignments

i) x = (a – b)+(c * d) ;

ii) y = (a < <3)| (b & 1b); **(06 Marks)**

b. Explain the pipelined execution of a branch in ARM using a pipeline diagram. **(04 Marks)**

c. What is a cache? Explain the following with diagram

i) Two – Level cache system

ii) Direct – Mapped cache

iii) Set – Associative cache **(10 Marks)**

3 a. Draw the UML state diagram of bus bridge operation and explain. **(06 Marks)**

b. Explain with a neat diagram, the bus with a DMA controller. **(06 Marks)**

c. Write a requirement table for an Alarm clock. **(08 Marks)**

4 a. Briefly explain Control/Data Flow Graphs. Draw the CDFG for the C codes given below

i) proc1( );
If (a < b)
proc2( );
else
proc3( )
proc4 ( );
switch(op)
{
case 1 : proc5( );
break;
case 2 : proc6( );
break;
case 3 : proc7( );
break;
}
Proc8( )

ii) for (i=0; i<N;i++)
{
a = proc1(a,b);
b =proc2 (a,b);
}

(06 Marks)

line of the following program. **(10 Marks)**

```
i)    ORG 100
   P1 CMP r0, r1
      BEQ P1
   P2 CMP r0, r2
      BEQ P2
   P3 CMP r0, r3
      BEQ P3
ii)    ORG  200
   P1  ADR r4, a
       LDR r0, [r4]
       ADR r4, e
       LDR  r1, [r4]
       ADD r0, r0, r1
       BNE  q1
   P2  ADR  r4, e
```

c. Explain briefly different types of performance measures on programs. **(04 Marks)**

PART – B

5 a. What is Real-Time operating system and Real-Time Kernel? Define Task Control Block (TCB) and describe the structure of a TCB. **(07 Marks)**

b. Explain the synchronization issues in resource utilization. Using the Dining Philosopher's problem. Mention the solutions for those issues. **(07 Marks)**

c. Three processes with process IDs P1, P2, P3 with estimated completion time 8, 5, 4 milliseconds respectively, enters the ready queue together in the or P_2, P_3, P_1. Process P_4 with estimated execution time 4 milliseconds entered the 'Ready' queue 3 milliseconds later the start of execution of P1. Calculate the waiting time and Turn Around Time (TAT) for each process and the Average waiting time and Average Turn Around time (Assuming there is no I/O waiting for the processes in RR algorithm with Time slice = 2ms. **(06 Marks)**

6 a. Explain briefly the concept of counting semaphore and Mutex. **(08 Marks)**

b. What is advanced configuration and power interface? Explain the basic global power states supported by ACPI. **(06 Marks)**

c. Describe how to evaluate OS performance in terms of the following:
   i) Context switching
   ii) Cache scheduling **(06 Marks)**

7 a. With a neat diagram, explain the various fields of CAN frame. **(07 Marks)**

b. Explain a neat diagram, the structure of an IP packet. **(07 Marks)**

c. List and explain the advantages and limitations of simulator Based Debugging. **(06 Marks)**

8 a. With a neat diagram, explain elements of the ARM AMBA bus system. **(05 Marks)**

b. Write a short note on Logic Analizer. **(05 Marks)**

c. Explain with a diagram the concept of Context switching, context saving and context Retrieval. **(05 Marks)**

d. Differentiate Non-preemptive SJF scheduling algorithm and Preemptive SJF scheduling algorithm with simple examples. **(05 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2015
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Define an embedded system. Explain the embedded system design process. (12 Marks)

b. Define digital command control (DCC). Explain the conceptual specification of a model train controller system. (08 Marks)

2 a. Explain the various data operations in ARM. (08 Marks)

b. Explain in detail the programming of I/O devices. (12 Marks)

3 a. Discuss memory interfacing and I/O interfacing in brief. (08 Marks)

b. What is DMA? Explain with a neat diagram. (06 Marks)

c. Explain briefly the development and debugging of an Alarm clock. (06 Marks)

4 a. Explain data flow and control/data flow graphs for programming models. (08 Marks)

b. List and explain different program optimization techniques. (12 Marks)

PART – B

5 a. Explain how threads and processes are used in RTOS. (10 Marks)

b. With a neat diagram, explain RTOS architecture. (05 Marks)

c. Define the following:
i) Task ii) Deadlock iii) Semaphore iv) Schedular v) Remote procedure call (RPC). (05 Marks)

6 a. Explain Inter-process communication and synchronization with signals. (10 Marks)

b. List the different functional and non-functional requirements while choosing an RTOS. (10 Marks)

7 a. Define a distributed embedded system. Explain. (06 Marks)

b. Compare I^2C bus and CAN bus over their use in embedded system. (10 Marks)

c. Describe the requirements for Elevator controller in brief. (04 Marks)

8 Write short notes on the following (5 marks each):

a. IDE

b. Pre-emptive scheduler

c. Simulator and emulator

d. Target system. (20 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Discuss the requirements chart, with an example. **(10 Marks)**
b. Explain the sequence diagram for transmitting control input in modern train controller. **(05 Marks)**
c. Explain the UML class diagram for signal and time out events. **(05 Marks)**

2 a. What is interrupt? Discuss its mechanism, with a neat diagram. **(08 Marks)**
b. Draw the format of ARM data processing instruction. **(06 Marks)**
c. What is set associative cache? Explain. **(06 Marks)**

3 a. Explain bus with DMA controller. **(07 Marks)**
b. Justify PC as a platform for embedded systems. **(08 Marks)**
c. Briefly discuss the process of two stage address translation in ARM. **(05 Marks)**

4 a. Sketch and explain the data flow graph model. **(08 Marks)**
b. Explain the program optimization techniques. **(12 Marks)**

PART – B

5 a. What is TCB? Explain its structure. **(05 Marks)**
b. Explain the structure of process. **(05 Marks)**
c. What is multitasking? Explain its types. **(05 Marks)**
d. What are the factors considered for selection of scheduling algorithm? **(05 Marks)**

6 a. Explain the technique in shared memory communication. **(10 Marks)**
b. Explain the following :
i) L – shaped usage distribution
ii) ACPI (advanced configuration and power interface). **(10 Marks)**

7 a. Explain the I^2C bus. **(05 Marks)**
b. What is multihop communication? **(05 Marks)**
c. Explain the structure of IP packet. **(05 Marks)**
d. Discuss any one application of internet. **(05 Marks)**

8 a. What is a simulator? Explain its advantages and limitations. **(06 Marks)**
b. What is boundary scan? Explain. **(08 Marks)**
c. What is monitor program based firmware debugging. **(06 Marks)**

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Seventh Semester B.E. Degree Examination, Dec. 2014/Jan. 2015
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define embedded system in the view point of authors i) Wayne Wolf ii) Todd. D. Morton. **(04 Marks)**

b. With a neat diagram, discuss various components of an embedded system. **(10 Marks)**

c. List and discuss various challenges faced in designing an embedded system. **(06 Marks)**

2 a. Describe the internal serial communication ports available in microcontroller 68HC11/12. **(06 Marks)**

b. List and explain design metrics necessary to design an embedded system. **(10 Marks)**

c. Write a note on SDIO. **(04 Marks)**

3 a. Define the following : i) Timer ii) RTC iii) Watchdog timer. **(06 Marks)**

b. Describe the features of CAN bus and its protocol for serial communication. **(06 Marks)**

c. Discuss the features of mobile system and wireless protocols : i) Bluetooth ii) ZigBee. **(08 Marks)**

4 a. How are the various interrupt sources classified? Discuss. **(06 Marks)**

b. Explain context switching, interrupt latency and service deadline. **(06 Marks)**

c. What is DMAC? Explain the steps of DMA. **(08 Marks)**

PART – B

5 a. Discuss CDFG in detail, with an example. **(06 Marks)**

b. Define the following : i) SDFG ii) APEGS iii) HSDFG. **(06 Marks)**

c. Distinguish between function, task and ISR with reference to their features. **(08 Marks)**

6 a. What is RTOS? List and explain the various services of RTOS. **(10 Marks)**

b. Discuss the three ways by which RTOS handles the ISRs in a multitasking environment. **(10 Marks)**

7 a. Discuss the various design principles of RTOS to design an embedded system. **(08 Marks)**

b. What are the methods of optimizing memory space in RTOS? **(04 Marks)**

c. Mention the various scheduling models. Explain the petri-net model for the task with a preemptive scheduler. **(08 Marks)**

8 a. What is a target system? How is embed software loaded into the target system? **(06 Marks)**

b. What is locator? What are the features of locator? **(06 Marks)**

c. Write a note on :
i) Simulators ii) ICE. **(08 Marks)**

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06CS74

Seventh Semester B.E. Degree Examination, June/July 2014
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO question from each part.***

PART – A

1 a. What are the challenges faced in designing an embedded system. **(06 Marks)**

b. Compare the definitions of embedded system from the following authors :
i) Wayne wolf ii) Todd D. Morton. **(04 Marks)**

c. Define design metrics in an embedded system. What are the different competing design metrics? What are the design process in an embedded system? **(10 Marks)**

2 a. What is charge pump? Explain the following terms related to embedded hardware units :
i) Clock oscillator circuit
ii) System timer
iii) Power –up reset and watch dog timer. **(10 Marks)**

b. Describe : i) UART ii) RS232C iii) SDIO. **(10 Marks)**

3 a. Compare the parallel ports interfaces for the keypad, stepper motor and touch screen. **(08 Marks)**

b. Explain the use of each control bit in I^2C bus protocol. **(05 Marks)**

c. Mention various wireless and mobile system protocols. Explain any two of them. **(07 Marks)**

4 a. What is virtual device driver? Explain any two of them, in detail. **(08 Marks)**

b. Explain context switching, interrupt latency and interrupt service deadline. **(08 Marks)**

c. How do the device driver functions and ISR functions differ? Explain. **(04 Marks)**

PART – B

5 a. Differentiate between function, task and ISR. **(06 Marks)**

b. What are the different programming models? With an example, explain the FSM model. **(08 Marks)**

c. What are the parameters of a task control block (TCB) of a task? Why should each task have a distinct TCB? **(06 Marks)**

6 a. What is RTOS? List and explain the different services of RTOS. **(10 Marks)**

b. What is the function of kernel in RTOS? Comprehend the different memory management strategy for a system. **(10 Marks)**

7 a. Describe earliest deadline first (EDF) and rate monotonic schedule (RMS) scheduling models. **(10 Marks)**

b. What are the design principles of RTOS to design an embedded system? Explain them. **(10 Marks)**

8 a. Explain : i) Simulators ii) ICE. **(10 Marks)**

b. What is the industry standard file format for storing the locator file? Show the memory needed in case of Princeton and Harvard architecture in the system. **(10 Marks)**

Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014

Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define embedded system. What are the characteristics and constrains of an embedded system? **(06 Marks)**

b. List and explain different types of memories used in embedded system with their functions. **(06 Marks)**

c. Discuss briefly the challenges faced in designing of an embedded system. **(08 Marks)**

2 a. What are the different classifications of embedded system? Mention the tools used in the development of each type of embedded system. **(06 Marks)**

b. Distinguish between three modes of serial communication 'Synchronous', 'Asychronous' and 'Iso – synchronous'. **(06 Marks)**

c. Describe the internal serial communication ports available in 68HC11 microcontroller. **(08 Marks)**

3 a. What is a watch dog timer? Mention its applications. **(04 Marks)**

b. Describe the features of CAN bus. Mention the function of each field in a CAN frame. **(08 Marks)**

c. Describe the features of

i) PCI bus

ii) Blue tooth. **(08 Marks)**

4 a. Give examples of interrupts that can arise from the following sources and briefly explain their use :

i) Internal hardware device sources

ii) External hardware device with internal vector address generation

iii) Software error related sources

iv) Software instruction – related sources. **(08 Marks)**

b. Define context, interrupt latency, interrupt service deadline. **(06 Marks)**

c. What is DMA? Explain the working of DMA controller with a block diagram. **(06 Marks)**

PART – B

5 a. Write and explain DFG for an output sequence y_6 of a FIR filter, where $y_n = \Sigma a_i x_{n-i}$. **(04 Marks)**

b. With an example, explain FSM model. **(06 Marks)**

c. Distinguish between function, task and ISR based on their characteristics. **(10 Marks)**

6 a. What is meant by user mode and supervisory mode of operation? Discuss in brief. **(04 Marks)**

b. What is kernel? List and explain the services it provides. **(08 Marks)**

c. Discuss different types of memory management strategies used by RTOS. **(08 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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7 a. Define hard real time and soft real time systems. Give an example for each. **(06 Marks)**

b. Describe the rate monotonic scheduler used in RTOS. What are its disadvantages? **(06 Marks)**

c. What are the methods used by the RTOS for saving and optimizing power in an embedded system. **(08 Marks)**

8 a. Describe in brief, the following tools used in development of embedded system

i) Source code engineering tool

ii) Integrated development environment tool

iii) Simulator

iv) In circuit emulator. **(08 Marks)**

b. Explain the working of a device programmer, with a diagram. **(08 Marks)**

c. What are the different metrics used for measuring the performance of an embedded system. **(04 Marks)**

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Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define embedded system. What are the characteristics and constrains of an embedded system? **(06 Marks)**
b. List and explain different types of memories used in embedded system with their functions. **(06 Marks)**
c. Discuss briefly the challenges faced in designing of an embedded system. **(08 Marks)**

2 a. What are the different classifications of embedded system? Mention the tools used in the development of each type of embedded system. **(06 Marks)**
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3 a. What is a watch dog timer? Mention its applications. **(04 Marks)**
b. Describe the features of CAN bus. Mention the function of each field in a CAN frame. **(08 Marks)**
c. Describe the features of
i) PCI bus
ii) Blue tooth. **(08 Marks)**

4 a. Give examples of interrupts that can arise from the following sources and briefly explain their use :
i) Internal hardware device sources
ii) External hardware device with internal vector address generation
iii) Software error related sources
iv) Software instruction – related sources. **(08 Marks)**
b. Define context, interrupt latency, interrupt service deadline. **(06 Marks)**
c. What is DMA? Explain the working of DMA controller with a block diagram. **(06 Marks)**

PART – B

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b. What is kernel? List and explain the services it provides. **(08 Marks)**
c. Discuss different types of memory management strategies used by RTOS. **(08 Marks)**

7 a. Define hard real time and soft real time systems. Give an example for each. **(06 Marks)**

b. Describe the rate monotonic scheduler used in RTOS. What are its disadvantages? **(06 Marks)**

c. What are the methods used by the RTOS for saving and optimizing power in an embedded system. **(08 Marks)**

8 a. Describe in brief, the following tools used in development of embedded system

i) Source code engineering tool

ii) Integrated development environment tool

iii) Simulator

iv) In circuit emulator. **(08 Marks)**

b. Explain the working of a device programmer, with a diagram. **(08 Marks)**

c. What are the different metrics used for measuring the performance of an embedded system. **(04 Marks)**

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Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014
Embedded Computing System

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is an embedded system? Explain the purpose of ES? List its major application areas and give one example for each? **(08 Marks)**

b. Differentiate the following, with an example :
   i) Microprocessor and microcontroller
   ii) Embedded system and general purpose computers. **(06 Marks)**

c. Write a requirement chart for digital camera? **(03 Marks)**

d. List challenges of embedded computing system design? Explain briefly any two challenges. **(03 Marks)**

2 a. What are the major difference between Von neuman and Hardward architecture? **(04 Marks)**

b. Explain the following :
   i) Restrictions of MUL instruction
   ii) Uses of MLA instruction
   iii) Register indirect addressing in ARM
   iv) Write a ARM assembly code for below C – statement z = (x | 22) and (y >> 2)
   v) Disadvantages of busy – wait IO? **(07 Marks)**

c. What is an interrupt? Explain with neat diagram the interrupt mechanism. **(05 Marks)**

d. Solve the following :
   i) What is the average memory access time of machine whose hit rate is 93% with cache access time of 5ns and mainmemory access time of 80 ns?
   ii) Calculate cache hit rate, if the cache access time is 5 ns, average memory access time is 6.5 ns and main memory access time is 80 ns? **(04 Marks)**

3 a. Explain with neat diagram, the bus with a DMA controller. **(05 Marks)**

b. Explain the following briefly :
   i) Counter
   ii) Watchdog timer
   iii) Break point
   iv) Timer. **(04 Marks)**

c. Differentiate PCI and USB by their characteristics. **(03 Marks)**

d. Assume that the bus has a 1 MHz bus clock period, width is 2 bytes per transfer, data transfer itself takes 1 clock cycles, address and handshaking signals before data is 2 clock cycles and sending ACK after data is 1 clock cycles
   i) What is the total transfer time in clock cycles to transfers of total 612000 bytes of data?
   ii) What is the total burst mode transfer time in clock cycle, if B = 2 byte with 2 byte wide
   iii) Calculate the total real time to transfer data. **(08 Marks)**

4 a. Consider the following ARM assembly code, which illustrate some sample C statement.

LDR	LDR	ADD	STR	LDR	LDR	ADD	STR	LDR	ADD	STR	LDR	LDR	SUB	STR
r_0, a	r_1, b	r_2, r_0, r_1	r_2,w	r_0, c	r_1, d	r_2, r_0, r_1,	r_2, x	r_1, e	r_0, r_1, r_2,	r_0,u	r_0, a	r_1, b	r_2, r_1, r_0,	r_2, z

Answer total following :

i) Write the sample C code fragment for the above ARM assembly code
ii) Draw a lifetime graph that shows uses of register in register allocation for the above C statement
iii) Modify the obtained C code statement using operator scheduling for register allocation
iv) Draw a lifetime graph for the modified 'C' code appear
v) Write a ARM assembly code for the modified 'C' code using register allocation. **(10 Marks)**

b. Consider the following 'C' code statement

```
if (a > b)
x = a + b ;
else
x = a – b ;
```

i) Write CDFG for the above 'C' statement
ii) Generate the ARM assembly code for the above 'C' statement. **(07 Marks)**

c. Explain briefly different types of performance measures on programs. **(03 Marks)**

PART – B

5 a. What is RTOS? Explain with an example the hard real time and soft real time. **(06 Marks)**

b. Differentiate process and threads. What are the parameters of PCB of a process? Why should each process have a distinct PCB? **(08 Marks)**

c. What is the significance of spinlock? **(02 Marks)**

d. What is semaphores? Explain briefly the different types of semaphores? **(04 Marks)**

6 a. Explain with neat diagram, the concept of memory mapped object. **(08 Marks)**

b. Explain the following :
i) Message passing
ii) Remote procedure call for IPC. **(06 Marks)**

c. What are the factors needs to be evaluated in selection of an RTOS? Explain. **(06 Marks)**

7 a. Explain with neat diagram the various fields of IP packet. **(08 Marks)**

b. List the features of internet LAN. **(04 Marks)**

c. With neat diagram, explain the various fields of CAN frame. **(06 Marks)**

d. Briefly explain any two features of HTTP protocols. **(02 Marks)**

8 a. Explain the following :
i) Simulator
ii) Target system
iii) Debugging
iv) Logic analyzer. **(08 Marks)**

b. Explain features advantages and limitations of simulator based debugging. **(06 Marks)**

c. Explain the types of multitasking. **(06 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2013
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What are major hardware units and devices in an embedded system? **(10 Marks)**

b. With the help of a neat diagram, explain the process of converting a C program into the file for ROM image. **(10 Marks)**

2 a. Explain with a neat diagram, the design process involved in an embedded system development. **(10 Marks)**

b. List various design challenges faced in designing an embedded system and methods to meet these challenges, with specific examples. **(10 Marks)**

3 a. List advantages and disadvantages of data transfer using serial and parallel ports. **(10 Marks)**

b. With a neat diagram, explain UART communication that uses handshaking signals. **(10 Marks)**

4 a. Explain the working of busy and wait transfer, highlighting its advantages. Mention a few applications where this method is used. **(10 Marks)**

b. Describe DMA transfer in an embedded system, with the help of a neat diagram. List the advantages of DMA transfer over interrupt driven transfer with a numeric example. **(10 Marks)**

PART – B

5 a. Give reasons for unfolding SDFGs into as many HSDFG (Homogeneous Synchronous Data Flow Graph) as feasible and then HSDFGs into as many APEGs (Acyclic Precedence Expansion Graph) as possible, with illustrations. **(10 Marks)**

b. What are the problems in modeling the processing of instruction in a multiprocessor system? Explain with an example of 2 processors PA and PB interfaced with the memory. **(10 Marks)**

6 a. What are various memory management strategies of an RTOS? **(10 Marks)**

b. Explain at least ten design principles when using an RTOS. **(10 Marks)**

7 a. What are various methods of saving and optimizing memory space in an embedded system? **(10 Marks)**

b. What are various performance metrics for an RTOS? **(04 Marks)**

c. Write important security functions required for RTOS security. **(06 Marks)**

8 a. Explain key features of simple target system with the help of a neat diagram. **(06 Marks)**

b. What are various OS porting issues in an embedded plat form? **(09 Marks)**

c. What are various subunits of back support hardware package and In-Circuit Emulator(ICE)? **(05 Marks)**

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Seventh Semester B.E. Degree Examination, December 2012

Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Give the characteristics and constraints of embedded system. **(04 Marks)**

b. Define design metrics in an embedded system. What are the different computing design metrics? What are the challenges faced in designing an embedded system. **(10 Marks)**

c. Describe the software tools used for designing an embedded system. **(06 Marks)**

2 a. With neat sketch, explain synchronous serial input and synchronous serial output operation. **(10 Marks)**

b. Briefly explain the skills required for an embedded system designer. **(06 Marks)**

c. Write a note on SDIO (secure digital input output). **(04 Marks)**

3 a. Describe: i) Timing device; ii) Counting device; iii) Timer cum counting device. **(06 Marks)**

b. Explain watch dog timer with any one its applications. **(06 Marks)**

c. With neat sketch, explain the control bit format in I^2C bus protocol. **(08 Marks)**

4 a. What is interrupt vector? Explain various mechanism of interrupt vector with suitable examples. **(10 Marks)**

b. Differentiate between device driver functions and ISR functions. **(05 Marks)**

c. Explain the role of device drivers in interaction with device hardware with suitable example. **(05 Marks)**

PART – B

5 a. Explain the modeling of a multi-processor system. **(07 Marks)**

b. Distinguish between function, ISR and Task. **(06 Marks)**

c. Define process and tasks. Explain the tasks with their states. **(07 Marks)**

6 a. Describe any four RTOS timer functions and the actions on calling these functions. **(04 Marks)**

b. Explain file system organization and implementation in an OS for an embedded system. **(08 Marks)**

c. Explain process creation and management of created process. **(08 Marks)**

7 a. Briefly explain the design principles when using an RTOS to design an embedded system. **(10 Marks)**

b. List any four common RTOS task scheduling models. **(04 Marks)**

c. Describe fixed real time scheduling model with an example. **(06 Marks)**

8 a. What are the features of integrated development environment (IDE)? Explain. **(07 Marks)**

b. Describe the platform dependency issues and the need for appropriate OS-hardware interface functions. **(08 Marks)**

c. Discuss the limitations of simulation with appropriate illustration. **(05 Marks)**

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Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define an embedded system. Explain the components of embedded system hardware. **(06 Marks)**

b. Point out major differences between Harvard and Von Neuman architecture. **(04 Marks)**

c. Explain the various software tools for designing an embedded system. **(08 Marks)**

d. Point out various applications of embedded system. **(02 Marks)**

2 a. Compare the advantages and disadvantages of data transfer using serial and parallel ports/devices. **(10 Marks)**

b. Describe and compare UART, Rs232C, SDI_o devices. **(10 Marks)**

3 a. What is a timer? How does a counter perform :
i) timer functions?
ii) prefixed time initiated event generation?
iii) time capture functions? **(10 Marks)**

b. Explain the following wireless and mobile system protocols :
i) Bluetooth ii) Zig Bee **(10 Marks)**

4 a. What do you mean by throwing an exception? How is the exception condition during execution of a function (routine) handled? **(10 Marks)**

b. What are the uses of hardware and software assigned priorities in interrupt service mechanism? **(10 Marks)**

PART – B

5 a. What are the different programming models? Give an example, explain the SDFG model. **(10 Marks)**

b. What is a semaphore? What are the IPC functions used by a software programmer? Explain them. **(10 Marks)**

6 a. What is a process manager? What are its services? **(06 Marks)**

b. What is RTOS? Point out and explain the various services of RTOS. **(10 Marks)**

c. Explain the user and supervisory mode structure in OS. **(04 Marks)**

7 a. Explain preemptive scheduling model. Point out the various scheduling models. **(08 Marks)**

b. What are the important operating system security issues? List the important security function. **(04 Marks)**

c. What are the methods of optimizing memory space in RTOS? **(08 Marks)**

8 a. What is a target system? How is embedded software loaded into the target system? **(10 Marks)**

b. What is a simulator? Illustrate the detailed design development process using a simulator. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, December 2011

Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. What is an embedded system? With the aid of a neat functional schematic, explain the components of an embedded system. Also indicate the important characteristics and constraints of the embedded system. **(10 Marks)**

b. Write down any ten important software tools, used for designing an embedded system, specifying their applications. **(10 Marks)**

2 a. Briefly explain the three classes of embedded systems. Further, discuss the skills required for an embedded system designer. **(10 Marks)**

b. A device port may have multibyte data input buffer(s) and data output buffer(s). What are the advantages of these? Also explain the characteristics that are taken into consideration when interfacing a device port in a system. **(10 Marks)**

3 a. With the aid of a functional diagram, describe have an internet –enabled embedded system is communicating to other systems on the internet. Explain the advantages of internet –enabled systems. **(10 Marks)**

b. What do you mean by plug and play devices? What are the bus protocols of buses UART, RS232C, USB, Bluetooth, CAN and PCI that support plug and play devices? Briefly explain. **(10 Marks)**

4 a. Define context, interrupt latency and interrupt service deadline. Why is the context switching in an embedded processor faster than saving the pointers and variables on the stack using a stack pointer? How does the context switching time reduces in processor architectures for embedded systems? Explain. **(10 Marks)**

b. With illustrative examples, explain the uses of the following in an interrupt –service mechanism
i) Hardwave – assigned priorities ii) Softwave – assigned priorities. **(10 Marks)**

PART – B

5 a. Why does the program complexity increases with a reduced number of DFGs and increasing decision nodes? Explain. **(04 Marks)**

b. How will you schedule the following instructions, on two processors?
i) SIMD ii) MIMD iii) VLIW. **(06 Marks)**

c. Briefly discuss the important characteristics of the functions, interrupt service routines (ISRs) and tasks, that are used in an embedded software. **(10 Marks)**

6 a. Explain any five RTOS timer functions and the action taken on calling these functions. **(10 Marks)**

b. Discuss the three approaches, used for interrupt routines in RTOS environment and handling of interrupt source calls. **(10 Marks)**

7 a. In brief, discuss the important design principles to be considered, while using an RTOS to design an embedded system. **(10 Marks)**

b. Show the use of semaphores for synchornising the tasks as co–operative scheduled tasks in preemptive RTOS. Also show the use of semaphores and times functions for synchronizing the tasks as round robin time – sliced scheduled tasks in a preemptive RTOS. **(10 Marks)**

8 a. What is a target system? How does the target system differ from the final embedded system? What do you mean by application software for a target system? Briefly discuss. **(06 Marks)**

b. Why is system performance index defined as the ability to meet required functions and specifications while using the minimum amount resources of memory, power dissipation and devices and minimum design efforts and optimum utilization of each resource? **(06 Marks)**

c. What is a simulator? With the aid of a neat block schematic, explain the detailed design development process using the simulator. **(08 Marks)**

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06CS74

Seventh Semester B.E. Degree Examination, June/July 2011
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define an embedded system. What are its main components? Classify the embedded systems. **(08 Marks)**

b. A 10-bit ADC has reference voltages V_{ref-} = -1.024V and V_{ref+} = 1.023V. What will be the output when inputs are i) -0.256V, ii) 0.512V , iii) 2.047V. What will be the output for the above inputs when V_{ref-} = -1.024V and V_{ref+} = +2.047V? **(12 Marks)**

2 a. List and explain any eight design metrics, used in embedded system. **(08 Marks)**

b. Describe how the communication takes place between COM port and UART serial port by using handshaking signals. **(06 Marks)**

c. How do you interface LCD controller through a parallel port? **(06 Marks)**

3 a. Describe the format of SDA bits in a I^2C bus protocol along with its signals. **(10 Marks)**

b. With a neat diagram, explain the Bluetooth protocol. **(06 Marks)**

c. A 16-bit counter is getting input from an internal clock of 12 MHz. There is a prescaling unit, which prescales by a factor of 16. What is the time interval at which overflow interrupt occurs? **(04 Marks)**

4 a. Discuss the classification of interrupt sources. **(06 Marks)**

b. Write a note on the Linux device drivers. **(08 Marks)**

c. What is the use of interrupt vector table? Explain how it is used in 8051 in case of short code ISR. **(06 Marks)**

PART – B

5 a. Explain SDFG model. How do you unfold SDFGs into HSDFGs and HSDFGs into APEGs? **(10 Marks)**

b. Describe the different states in FSM model for a mobile key '5' of T_q keypad. **(10 Marks)**

6 a. Distinguish between ISRs and Tasks. **(10 Marks)**

b. Explain the user and supervisory mode structure in OS. **(04 Marks)**

c. What are the command functions, used in the device management? **(06 Marks)**

7 a. Discuss the round robin time scheduling, with its programming model and the graph for counter assignment **(12 Marks)**

b. Which are the OS security issues? List the important security functions. **(08 Marks)**

8 a. Explain the various software tools, used in the embedded systems? **(08 Marks)**

b. What is a target system? How does it differ from final embedded system? **(06 Marks)**

c. How do you perform testing on the host machine? **(06 Marks)**

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Important Note : 1. On completing your answers, comp
2. Any revealing of identification, app

	b.	Explain the modeling of
	c.	Define process and task
6	a.	Explain how processes a
	b.	"Memory allocation an Explain the memory ma
	c.	What is the importance
7	a.	What is RTOS? Explain
	b.	Mention the various sch
	c.	What should be the OS
8	a.	What is a target system?
	b.	Explain : i) Simulators
	c.	Why do we use an host host machine?

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. How does an embedded system differ from a general purpose computer? **(04 Marks)**

b. What are the possible devices available to a system designer to use it as a processor in an embedded system? What are the important considerations when selecting a processor? **(10 Marks)**

c. What are the challenges faced in designing an embedded system? **(06 Marks)**

2 a. Explain briefly the different software modules and tools for designing an embedded system. **(06 Marks)**

b. Describe the internal serial communication ports available in microcontroller 68HCll. **(08 Marks)**

c. Draw the functional diagram of a typical parallel port showing the handshaking signals. Describe the communication using it. **(06 Marks)**

3 a. Explain how port-based input/output is different from bus-based input/output. **(04 Marks)**

b. Describe the features of CAN bus and its protocol for serial communication. **(08 Marks)**

c. What is PCI bus? Explain the features of PCI bus and standards available. **(08 Marks)**

4 a. How are the various interrupt sources classified? **(06 Marks)**

b. What is interrupt latency? How the worst case latency can be estimated? **(06 Marks)**

c. What are the points that must be known and the information that must be available before writing a software for a device driver in assembly language? **(08 Marks)**

PART – B

5 a. Explain the state machine programming model. Draw the state transition diagram to show the finite state machine of a task in a multi-tasking program. **(08 Marks)**

b. What are the parameters of a task control block (TCB) of a task? Why should each task have a distinct TCB? **(06 Marks)**

c. Differentiate between function, task and ISR. **(06 Marks)**

6 a. What is a process manager? What are the services of process manager? **(06 Marks)**

b. How does memory allocation differ in RTOS as compared to conventional OS? Explain what is memory locking. **(06 Marks)**

c. Briefly explain the three ways in which RTOS handles the ISRs in a multitasking environment. **(08 Marks)**

7 a. What are the steps by RTOS to meet hard-real time dead lines? **(06 Marks)**

b. What are the methods of optimizing memory space in RTOS? **(06 Marks)**

c. Describe earliest deadline first (EDF) and rate monotonic schedule (RMS) scheduling models. **(08 Marks)**

8 a. What is a target system? With the help of a block diagram, illustrate the different components of target a system. How does the target system differ from the final embedded system? **(08 Marks)**

b. What is locator? What are the features of locator? **(06 Marks)**

c. With a neat block schematic, explain how would you get an embedded software into the target system? **(06 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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06CS74

Seventh Semester B.E. Degree Examination, Dec.09-Jan.10
Embedded Computing Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each Part.***

PART – A

1 a. Compare the definitions of embedded system from the following authors i) Wayne Wolf ii) Todd.D. Mortan. **(04 Marks)**

b. What are the major differences between Harvard and Von Neuman architecture? Give an example. **(06 Marks)**

c. What are the functional circuits in a microcontroller chip? Explain them in detail. **(10 Marks)**

2 a. What is charge pump? Explain the following terms related to embedded hardware units : i) Clock oscillator circuit ii) System timer iii) Power – up reset and watch – dog timer. **(10 Marks)**

b. Comprehend the procedure to code high level and assembly software into m/c implementable software, for an embedded system. Highlight their differences. **(10 Marks)**

3 a. Compare the parallel ports interfaces for the keypad, stepper motor and touch screen. **(10 Marks)**

b. Describe and compare UART and HDLC protocol. **(10 Marks)**

4 a. Show the procedure of diversion to higher priority interrupts. **(06 Marks)**

b. What is DMAC? Explain the steps of DMA to facilitate a multi byte data transfer. **(06 Marks)**

c. What is virtual device driver? Explain any two of them in detail. **(08 Marks)**

PART – B

5 a. What are the Task and ISR? Distinguish among the ISRs, Tasks and functions. **(10 Marks)**

b. What is a semaphore? What are the IPC functions used by a software programmer? Explain them. **(10 Marks)**

6 a. What is the function of Kernal in RTOS? Comprehend the different memory management strategy for a system. **(10 Marks)**

b. What is RTOS? List and explain the different services of RTOS. **(10 Marks)**

7 a. What are the design principles of RTOS to design an embedded system? Explain them. **(10 Marks)**

b. What is the significance of spin lock? Narrate the petrinet based model for critical section service, by a preemptive scheduler. **(10 Marks)**

8 a. What is industry standard file format for storing the locator file? Show the memory needed in case of Princeton and Harvard architecture in the system. **(10 Marks)**

b. What is a simulator? Illustrate the detailed design development process using a simulator. **(10 Marks)**