

Department of Higher Education
University of Computer Studies, Hinthada
Fifth Year (B.C.Sc./B.C.Tech.)

English

Mid-Term Examination

March, 2018

Answer All questions.

Time allowed: 3 Hours

-QUESTION I

(20 Marks)

Read the following passage and answer Questions 1-10.

- A. One of the most captivating natural events of the year in many areas throughout North America is the turning of the leaves in the fall. The colours are magnificent, but the question of exactly why some trees turn yellow or orange, and others red or purple, is something which has long puzzled scientists.
- B. Summer leaves are green because they are full of chlorophyll, the molecule that captures sunlight and converts that energy into new building materials for the tree. As fall approaches in the northern hemisphere, the amount of solar energy available declines considerably. For many trees - evergreen conifers being an exception - the best strategy is to abandon photosynthesis * until the spring. So rather than maintaining the now redundant leaves throughout the winter, the tree saves its precious resources and discards them. But before letting its leaves go, the tree dismantles their chlorophyll molecules and ships their valuable nitrogen back into the twigs. As chlorophyll is depleted, other colours that have been dominated by it throughout the summer begin to be revealed. This unmasking explains the autumn colours of yellow and orange, but not the brilliant reds and purples of trees such as the maple or sumac.
- C. The source of the red is widely known: it is created by anthocyanins, water-soluble plant pigments reflecting the red to blue range of the visible spectrum. They belong to a class of sugar-based chemical compounds also known as flavonoids. What's puzzling is that anthocyanins are actually newly minted, made in the leaves at the same time as the tree is preparing to drop them. But it is hard to make sense of the manufacture of anthocyanins - why should a tree bother making new chemicals in its leaves when it's already scrambling to withdraw and preserve the ones already there?
- D. Some theories about anthocyanins have argued that they might act as a chemical defence against attacks by insects or fungi, or that they might attract fruit-eating birds or increase a leaf's tolerance to freezing. However there are problems with each of these theories, including the fact that leaves are red for such a relatively short period that the expense of energy needed to manufacture the anthocyanins would outweigh any anti-fungal or anti-herbivore activity achieved.
- E. It has also been proposed that trees may produce vivid red colours to convince herbivorous insects that they are healthy and robust and would be easily able to mount chemical defences against infestation. If insects paid attention to such advertisements, they might be prompted to lay their eggs on a duller, and presumably less resistant host. The flaw in this theory lies in the lack of proof to support it. No one has as yet ascertained whether more robust trees sport the brightest leaves, or whether insects make choices according to colour intensity.
- F. Perhaps the most plausible suggestion as to why leaves would go to the trouble of making anthocyanins when they're busy packing up for the winter is the theory known as the 'light screen' hypothesis. It sounds paradoxical, because the idea behind this hypothesis is that the red pigment is made in autumn leaves to protect chlorophyll, the light-absorbing chemical, from *too much light*. Why does chlorophyll need protection when it is the natural world's supreme light absorber? Why protect chlorophyll at a time when the tree is breaking it down to salvage as much of it as possible?
- G. Chlorophyll, although exquisitely evolved to capture the energy of sunlight, can sometimes be overwhelmed by it, especially in situations of drought, low temperatures, or nutrient deficiency. Moreover, the problem of oversensitivity to light is even more acute in the fall, when the leaf is busy preparing for winter by dismantling its internal machinery. The energy absorbed by the chlorophyll molecules of the unstable autumn leaf is not immediately channelled into useful products and processes, as it would be in an intact summer leaf. The weakened fall leaf then becomes vulnerable to the highly destructive effects of the oxygen created by the excited chlorophyll molecules.

- H. Even if you had never suspected that this is what was going on when leaves turn red, there are clues out there. One is straightforward: on many trees, the leaves that are the reddest are those on the side of the tree which gets most sun. Not only that, but the red is brighter on the upper side of the leaf. It has also been recognised for decades that the best conditions for intense red colours are dry, sunny days and cool nights, conditions that nicely match those that make leaves susceptible to excess light. And finally, trees such as maples usually get much redder the more north you travel in the northern hemisphere. It's colder there, they're more stressed, their chlorophyll is more sensitive and it needs more sunblock.
- I. What is still not fully understood, however, is why some trees resort to producing red pigments while others don't bother, and simply reveal their orange or yellow hues. Do these trees have other means at their disposal to prevent overexposure to light in autumn? Their story, though not as spectacular to the eye, will surely turn out to be as subtle and as complex.

Questions 1-3: Do the following statements agree with the information in the reading passage?

- TRUE** *if the statement agrees with the information*
FALSE *if the statement contradicts the information*
NOT GIVEN *if there is no information on this*

1. It is likely that the red pigments help to protect the leaf from freezing temperatures.
2. The 'light screen' hypothesis would initially seem to contradict what is known about chlorophyll.
3. Leaves which turn colours other than red are more likely to be damaged by sunlight.

Questions 4-7: Complete the sentences below. Choose ONE WORD ONLY from the passage for each answer.

4. The most vividly coloured red leaves are found on the side of the tree facing the _____.
5. The _____ surfaces of leaves contain the most red pigment.
6. Red leaves are most abundant when daytime weather conditions are _____ and sunny.
7. The intensity of the red colour of leaves increases as you go further _____.

Questions 8-10: Which paragraph contains the following information?

8. a description of the substance responsible for the red colouration of leaves
9. the reason why trees drop their leaves in autumn
10. some evidence to confirm a theory about the purpose of the red leaves

QUESTION II

(20 Marks)

II. (A) Change the following sentences into correct tense by using the words given in the brackets.

1. It (expect) that the President will resign due to the recent revelations.
2. A cinema is a place where films (show).
3. We were driving along quite fast but we (overtake) by lots of other cars.
4. In the United states, elections for President (hold) every four years.
5. The boat sank quickly but fortunately everybody (rescue).
6. While I was on holiday, my camera (steal) from my hotel room.
7. Originally the book (write) in Spanish and a few years ago it was translated into English.
8. Most of the earth's surface (cover) by water.
9. The situation is serious. Something must (do) before it's too late.
10. It's not certain how the fire started but it might (cause) by an electrical fault.

II. (B) Make sentences from the words in brackets. Sometimes the verb is active, sometimes passive.

1. A tree was lying across the road. (it/ blow down/ in the storm).
2. My car has disappeared. (it / steal)
3. The police have found the people they were looking for. (two people / arrest / last night).
4. The man next door disappeared six months ago. (nobody / see / since then).
5. Tom gets a higher salary now. (he / promote)

QUESTION III

(20 Marks)

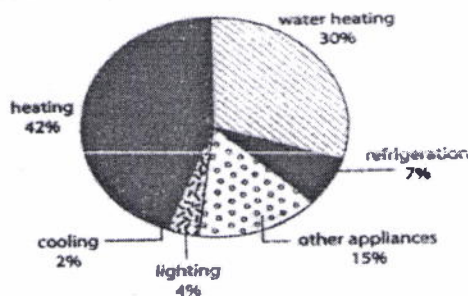
III. (A). Rewrite the sentences in such a way which mean exactly the same as the sentence that is given.

1. The number of air travellers fluctuated remarkably.
There was -----.
2. Sales of convenience food increased steeply.
There was -----.
3. There was a gradual decline in sugar imports.
Sugar imports -----.
4. There was a sudden decrease in the sale of mangoes.
The sale of mangoes -----.
5. There has been a dramatic rise in the production of films.
The production of films -----.

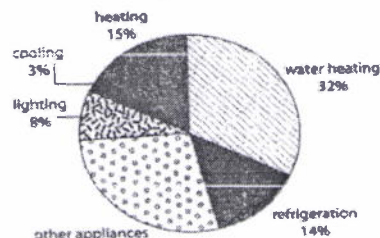
III. (B) You should spend about 20 minutes on this task.

The first chart below shows how energy is used in an average Australian household. The second chart shows the greenhouse gas emissions which result from this energy use. Summarise the information by selecting and reporting the main features, and make comparisons where relevant.

Australian household energy use



Australian household greenhouse gas emissions



QUESTION IV

(20 Marks)

IV. (A) Describe a person who has done a lot of work to help people. You should say

- *who this person is / was*
- *where this person lives / lived*
- *what he / she has done to help people*

And explain how you know about this person.

IV. (B) Answer these questions about yourself.

1. Do you agree, Reading is one of the best ways of learning? Why?
2. How do you spend your free time?
3. Which places do you like to visit in Myanmar? Why?
4. Do you explain about your daily life?
5. What benefits do you get by attending University of computer studies?

QUESTION V

(20 Marks)

Write an ESSAY on the following topic.

There is a good deal of evidence that increasing car use is contributing to global warming and having other undesirable effects on people's health and well-being.

What can be done to discourage people from using their cars. Write at least 250 words.

*****END*****

Department of Higher Education
University of Computer Studies, Hinthada
Fifth Year (B.C.Sc./ B.C.Tech.)
Mid-Term Examination
Mathematics of Computing V (CST-501)
March, 2018

Answer All Questions.

Time Allowed: 3 Hours.

1. (a) A phone store stocks a particular model computer that can be ordered weekly. Let D_1, D_2, \dots represent the demand for this phone (the number of units that would be sold if the inventory is not depleted) during the first week, second week, ..., respectively. It is assumed that the D_i are independent and identically distributed random variable having a Poisson distribution on with a mean of 1. Let X_0 represent the number of phones on hand at the outset, X_1 the number of phones on hand at the end of week 1, X_2 the number of phones on hand at the end of week 2, and so on. Assume that $X_0 = 3$. On Saturday night the store places an order that is delivered in the time for the next opening of the store on Monday. The store uses the following ordered policy. If there are number of phones on hand at the end of the week is 0 or 1, two additional phones will take place. The cost is changed as follows:

$$C(X_t) = \begin{cases} 0 & \text{if } X_t = 0 \\ 2 & \text{if } X_t = 1 \\ 8 & \text{if } X_t = 2 \\ 18 & \text{if } X_t = 3 \end{cases}$$

- (i) Find the steady-state probabilities of the state of this Markov chain.
(ii) Find the long-run expected average storage cost per week.
- (b) A machine is inspected at the end of every hour. It is found to be either working (up) or failed (down). If the machine is found to be up, the probability of its remaining down for the next hour is 0.1. If it is down, the computer is repaired, which may require more than 1 hour. Whenever the machine is down, the probability of its still being up 1 hour later is 0.65.
- (i) Construct the (one-step) transition matrix for this Markov chain.
(ii) Find the μ_{ij} (the expected first passage time from state i to state j) for all i and j .
2. (a) Consider the following gambler's ruin problem. A gambler bets \$ 1 on each play of a game. Each time, he has a probability α of winning and probability $(1 - \alpha)$ of losing the dollar bet. He will continue to play until he goes broke or nets a fortune of T dollars. Let X_n denote the number of dollars possessed by the gambler after the n^{th} play of the game. $\{X_n\}$ is a Markov chain. The gambler starts with X_0 dollars, where X_0 is appositve integer less than T .
- (i) Construct the (one step) transition matrix of the Markov chain.
(ii) Find the classes of the Markov chain.
(iii) Let $T = 3$ and $\alpha = 0.7$. Find $f_{10}, f_{1T}, f_{20}, f_{2T}$
- (b) The state of a particular continuous time Markov chain is defined as the number of jobs currently at a certain work center where a maximum of two jobs are allowed. Jobs arrive individually. Whenever fewer than three jobs are present, the time until the next arrival has an exponential distribution with mean of $\frac{1}{2}$ day. Jobs are processed at the work center one at a time and then leave immediately. Processed at the work center one at a time and then leave immediately. Processing times have an exponential distribution with a mean of $\frac{1}{4}$ day.
- (i) Construct the rate diagram for this Markov chain
(ii) Write the steady-state equations.
(iii) Solve these equations for the steady-state probabilities.
3. (a) The jobs to be performed on a particular machine arrive according to a Poisson input process with a mean rate of two per hour. Suppose that the machine breaks down and will require

- 1 hour to be repaired. What is the probability that the number of new jobs that will arrive during this time is (i) 0, (ii) 2, (iii) 5 or more?
- (b) Suppose that a queueing system has two servers, an exponential interarrival time distribution with a mean of 2 hours, and an exponential service-time distribution with a mean of 2 hours for each server. Furthermore, a customer has just arrived at 12:00 noon.
- (i) Suppose that no additional customers arrive before 1:00 pm. Now what is the probability that the next arrival will come between 1:00 and 2:00 pm?
- (ii) What is the probability that the number of arrivals between 1:00 and 2:00p.m. will be (a) 0, (b) 1, (c) 2 or more?
- (iii) Suppose that both servers are serving customers at 1:00 p.m. What is the probability that neither customer will have service completed (a) before 2:00 pm. (b) before 1:10 pm. (c) before 1:01pm.?
4. (a) A maintenance person has the job of keeping two machines in working order. The amount of time that a machine works before breaking down has an exponential distribution with a mean of 11 hours. The time then spent by the maintenance person to repair the machine has an exponential distribution with a mean of 8 hours.
- (i) Construct the rate diagram.
- (ii) Develop the balance equations.
- (iii) Solve these equations to find the steady-state probability distribution of the number of machines breaking down.
- (iv) Calculate L , L_q , W , W_q .
- (v) Determine the proportional of time that the maintenance person is busy.
- (b) The time required by a mechanic to repair a machine has an exponential distribution with a mean of 4 hours. However, a special tool would reduce this mean to 2 hours. If the mechanic repairs a machine in less than 2 hours, he is paid \$100, otherwise he is paid \$80. Determine the mechanic's expected increase in pay per machine repaired if he uses the special tool.
5. (a) The Rustbelt Manufacturing Company will be opening a new box office where customers can come to make ticket purchases in advance for the many entertainment events being held in the area. Simulation is being to analyze whether to has one clerk on duty at the box office. While simulating the beginning of a day at the box office the first customer arrives 5 minutes after it opens and then the inter arrival times for the next four customers (in order) are 3 minutes, 9 minutes, 2 minutes, and 4 minutes, after which there is a long delay until the next customer arrives. The service times for these first five customers (in order) are 8 minutes, 6 minutes, 2 minutes, 4 minutes and 7 minutes.
- (i) For alternative of a single clerk, plot a graph that shows the evolution of customers at the box office over this period.
- (ii) Use this figure to estimate the usual measures of performance L , L_q , W , W_q and the P_n for this queueing system.
- (b) (i) Use the mixed congruential method to generate a sequence of five two-digit random integer numbers such that $x_{n+1} \equiv (61x_n) \pmod{100}$ and $x_0 = 10$. Convert these random integer numbers to uniform random numbers.
- (ii) Use four uniform random numbers as instructed (0.010, 0.569, 0.411, 0.665), generate random observations from the following probability distributions. The distribution whose probability density function is

$$f(x) = \begin{cases} \frac{1}{4}(x+1)^3 & \text{if } -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

**Department of Higher Education
University of Computer Studies, Hinthada
Fifth Year (B.C.Sc./B.C.Tech.)
Mid-Term Examination
Distributed System + Advanced Networking (CST-502)
March, 2018**

Answer All Questions.

Time Allowed: 3 Hours

Advanced Networking

1. Write short notes on **ANY FIVE** of the followings. **(10 marks)**

- (a) IP routers
- (b) Two fundamental observations in network-level interconnection
- (c) IPv4 directed broadcast address
- (d) Sub-netting
- (e) MPLS ingress
- (f) Label swapping
- (g) NAT (Network Address Translation)
- (h) VPN (Virtual Private Network)
- (i) Information security
- (j) IPsec

2. Choose **ANY TWO** of the following questions. **(10 marks)**

- (a) Explain advantages of the network-level interconnection.
- (b) What is architecture of internet?
- (c) An ISP leased you the following network.

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You need to create 60-subnetworks from the single network.

- (1) What will be your new subnet mask?
- (2) How many hosts will be supported in each subnet?
- (3) What is the subnet address of the fourth subnet?
- (4) What is the broadcast address of the sixth subnet?
- (d) Router R₁ has an interface named Gigabit Ethernet 0/1, whose MAC address has been set to 5055.4444.3333. This interface has been configured with ipv6 address 2000:1:1:1::/64 eui-64 subcommand. What unicast address will this interface use?

- 3.(a) How can an MPLS label accompany a datagram across a conventional network? **(10 marks)**
- 3.(b) How does a VPN tunnel work? **(10 marks)**
- 3.(c) Which protocol header used in IPsec to handle confidentiality? **(10 marks)**

*****END*****

Department of Higher Education
University of Computer Studies, Hinthada
Fifth Year (B.C.Tech.)
Mid-Term Examination
Computer System Fundamentals (CT-503)
March, 2018

Answer All Questions.

Time Allowed: 3 Hours

1. (a) Computer A has an overall CPI of 1.3 and can be run at a clock rate of 600MHz. Computer B has a CPI of 2.5 and can be run at a clock rate of 750MHz. A particular program will be run on these computers. When compiled for computer A, this program has exactly 100,000 instructions. How many instructions would the program need to have when compiled for Computer B, in order for the two computers to have exactly the same execution time for this program? **(8 Marks)**

1. (b) For problems below, use the information about access time for every type of memory in the following table. **(8 Marks)**

Cache	DRAM	Flash Memory	Magnetic Disk
5 ns	50 ns	5 μ s	5 ms

- (i) Find how long it takes to read a file from a DRAM if it takes 2 microseconds from the cache memory.
- (ii) Find how long it takes to read a file from a disk if it takes 2 microseconds from the cache memory.
- (iii) Find how long it takes to read a file from a flash memory if it takes 2 microseconds from the cache memory.
- (iv) Find how long it takes to read a file from DRAM if it takes 20 nanoseconds from the cache memory.

2. (a) The parameter variables g, h, i, and j correspond to the argument registers \$a0, \$a1, \$a2, and \$a3, and f corresponds to \$s0. What is the compiled MIPS assembly code for the following procedure? **(8 Marks)**

```
int leaf_example (int g, int h, int i, int j)
{
    int f;
    f = (g + h) - (i + j);
    return f;
}
```

2. (b) The following hexadecimal values represent the opcode of an instruction. **(8 Marks)**

(1) 0x01090012 (2) 0xAD090012 .

- (i) Translate the decimal numbers from these values
- (ii) What instruction do they represent?
- (iii) Which types of instructions (I, R, J) will be represented by the above hexadecimal entries?
- (iv) What is the value of the opcode field and *rt* field?

3. (a) The following C procedure performs a sort on the array v. **(8 Marks)**

```
void sort (int v[ ], int n){
    int i, j;
    for (i = 0; i < n; i +=1) {
        for (j = i - 1; j >= 0 && v[j] > v[j+1]; j -= 1) {
            swap (v, j);
        }
    }
}
```

If the two parameters of the procedure sort, v and n, are in the parameter registers \$a0 and \$a1, and assign register \$s0 to i and register \$s1 to j, what is the MIPS assembly code for this C procedure?

3. (b) Perform the following operations by converting the operands to 2's complement binary numbers and then doing the addition or subtraction shown. Please show all work in binary, operating on 16-bit numbers. **(8 Marks)**
- (i) $3 + 12$ (ii) $13 - 2$ (iii) $5 - 6$ (iv) $-7 - (-7)$
4. (a) The floating-point format to be used in this problem is an 8-bit IEEE 754 normalized format with 1 sign bit, 4 exponent bits, and 3 mantissa bits. It is identical to the 32-bit and 64-bit formats in terms of the meaning of fields and special encodings. The exponent field employs an excess-7 coding. The bit fields in a number are (sign, exponent, mantissa). Assume that we use unbiased rounding to the nearest even specified in the IEEE floating point standard. **(8 Marks)**
- (i) Encode the following numbers to the 8-bit IEEE format:
- (1) 0.0011011_{two} (2) 16.0_{ten}
- (ii) Perform the computation $1.011_{\text{binary}} + 0.0011011_{\text{binary}}$ showing the correct state of the guard, round and sticky bits. There are three Mantissa bits.
- (iii) Decode the following 8-bit IEEE number into their decimal value: 1 1010 101.
4. (b) Calculate A divided by B using non-restoring division algorithm. Assume A and B are 6-bit unsigned integers. **(8 Marks)**
- A = 37 B = 15
5. (a) There are situations in pipelining when the next instruction cannot execute in proper clock cycle. These events are called hazards, and there are three different types. (i) Describe three hazards and explain them. (ii) What is the primary solution to against the data hazard? Explain this solution with example? (iii) What kind of instruction cannot be prevented from data hazard by using the above primary solution? **(9 Marks)**
5. (b) Illustrates the active portion of the datapath (without control lines) that is used in all five stages of a store instruction. **(9 Marks)**
6. (a) Consider the following code segment in C: **(8 Marks)**
- f = g + h;
i = j - k;
- The following MIPS code for this C segment, assuming all variables are in memory and are addressable as offsets from \$t0.
- ```
lw $t1, 0($t0)
lw $t2, 4($t0)
add $t1, $t1, $t2
sw $t1, 16($t0)
lw $t3, 8($t0)
lw $t4, 12($t0)
sub $t3, $t3, $t4
sw $t3, 20($t0)
```
- Name the possible pipeline hazard and find the hazards in the preceding code segment and reorder the instructions to avoid any pipeline stalls.
6. (b) The jump instruction looks somewhat like a branch instruction but compute target PC differently and is not conditional. Like branch, the low-order 2 bits of a jump address are always  $00_{\text{two}}$ . The next lower 26 bits of this 32-bit address come from the 26-bit immediate field in the instruction. The upper 4 bits of the address that should replace the PC come from the PC of the jump instruction plus 4. Show how to implement the required jump instruction with data path and control lines. **(10 Marks)**

\*\*\*\*\*END\*\*\*\*\*



**Department of Higher Education**  
**University of Computer Studies, Hinthada**  
**Fifth Year (B.C.Tech.)**  
**Mid-Term Examination**  
**Embedded Systems (CT-504)**  
**March, 2018**

**Answer All Questions.**

**Time Allowed: 3 Hours**

1. Choose the correct answer.
- (i). Which of the following uses its own address space?  
(a) thread (b) process  
(c) task (d) kernel
- (ii). ----- deals with the flag but cannot carry implicit information?  
(a) Semaphore (b) Message passing  
(c) Threads (d) Process
- (iii). Which task method follows a currently running task to be stopped by a higher priority task?  
(a) Scheduling algorithm (b) Time slice  
(c) Cooperative multitasking (d) Pre-emption
- (iv). Which interrupt provides system clock in the context switching?  
(a) Software interrupt (b) Hardware interrupt  
(c) Peripheral (d) Memory
- (v). ----- allows a lower priority task to run despite the higher priority task is active and waiting to preempt?  
(a) Message queue (b) Message passing  
(c) Semaphore (d) Priority inversion
- (vi). Which of the scheduling algorithm are based on the assumption that tasks are executed until they are done?  
(a) Periodic task (b) Aperiodic task  
(c) Non-preemptive scheduling (d) Preemptive scheduling
- (vii). Which of the following periodic scheduling is dynamic?  
(a) RMS (b) EDF  
(c) LST (d) LL
- (viii). In I2C bus, pull-up resistors keep the lines at Vcc when  
(a) All the drivers are active (b) None of the drivers are active  
(c) Some of the drivers are at sleep (d) None of the driver is at sleep
- (ix). In real time operating system  
(a) All processes have the same priority (b) A task must be serviced by its deadline period  
(c) Process scheduling can be done only once (d) Kernel is not required
- (x). The ability of an operating system to control the activities of multiple programs at the same time is called  
(a) Multitasking (b) Multiprocessing  
(c) Multioperating (d) Multipaging
- (xi). Which of the following can be used to distribute the time slice across all the tasks?  
(a) Timer (b) Counter  
(c) Round-robin (d) Task slicing
- (xii). Which of the following defines the task which must be executed at every defined unit of time?  
(a) Aperiodic task (b) Periodic task  
(c) Job (d) Process

- (xiii). A bluetooth LAN is an  
 (a) Adhoc Network (b) Infrastructure Signals  
 (c) Adhoc Signals (d) Infrastructure LAN
- (xiv). In rate monotonic scheduling  
 (a) Shorter duration job has higher priority (b) Longer duration job has higher priority  
 (c) Priority does not depend on the duration of the job (d) None of the above mentioned
- (xv). ----- possesses threads of execution?  
 (a) Process (b) Thread  
 (c) Kernel (d) Operating system
- (xvi). Which can be considered as the lower level in the multitasking operating system?  
 (a) process (b) task  
 (c) threads (d) multi threads
- (xvii). Which forms the heart of the operating system?  
 (a) Kernel (b) Applications  
 (c) Hardware (d) Operating system
- (xviii). Which of the following can carry information and control task?  
 (a) Semaphore (b) Message Passing  
 (c) Flags (d) Address message
- (xix). System which possesses data instructions without any delay is classified as  
 (a) Real time system (b) Online system  
 (c) Non real time system (d) Instruction system
- (xx). A semaphore  
 (a) is a binary mutex (b) must be accessed from only one process  
 (c) can be accessed from multiple processes (d) none of the above mentioned

(20 marks)

2. Answer **ANY FOUR** of the followings:

- (a) Difference between static priority and dynamic priority  
 (b) Two fundamental abstractions to build complex applications on microprocessors  
 (c) Three basic scheduling states of a process  
 (d) Functional architecture of a generic consumer electronics device  
 (e) Organizational Diagram of a compact disc mechanism  
 (f) State transition graph for master's action of an I<sup>2</sup>C bus  
 (g) Architecture of a CAN bus controller

(20 marks)

3. (a) Define CPU utilization and hyperperiod.

You are given these periodic tasks:

| Task | Period               | Execution time       |
|------|----------------------|----------------------|
| P1   | $1.0 \times 10^{-3}$ | $1.0 \times 10^{-4}$ |
| P2   | $1.0 \times 10^{-3}$ | $2.0 \times 10^{-4}$ |
| P3   | $5.0 \times 10^{-3}$ | $3.0 \times 10^{-4}$ |

- (i) Determine the hyperperiod of the system.  
 (ii) Compute the CPU utilization over the hyperperiod of the system.
- (b) Which type of scheduling is used the Rate-monotonic scheduling (RMS)? What principles are regarded for RMS system model? For the periodic processes shown in the following table, compute the process time line-in length to hyperperiod using RMS policy and illustrate the result with the diagram where time starts at  $t = 0$ . If the execution time of P1 is changed to 2 unit times, calculate the result of the total CPU time.

| Process | Execution Time | Period |
|---------|----------------|--------|
| P1      | 1              | 4      |
| P2      | 2              | 6      |
| P3      | 3              | 12     |

4.(a) Distinguish between single threading and multithreading of the embedded system. Explain the certain key functions of the accelerator in embedded multiprocessor. In Figure.4(a), the system shows that the data dependencies allow P2 and P3 to run independently on the CPU, but P2 relies on the results of the A1 process that is implemented by the accelerator. Redraw the diagram with the actions of the single threaded case and multithreaded case of the system. Explain how the single-threaded versus multithreaded control of an accelerator effects on the CPU performance by using with the timing diagrams. **(20 marks)**

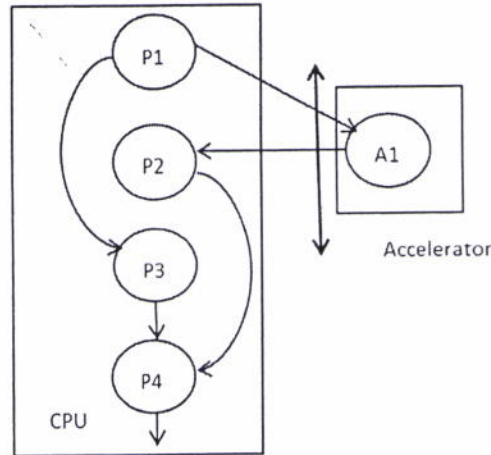


Figure. 4(a)

(b) What transition states are used in SCL and SDL of the I<sup>2</sup>C bus transaction when initiating and completion of a signal? What is the format of the I<sup>2</sup>C address transmission? Illustrate the formats of the typical complete I<sup>2</sup>C bus transactions. **(20 marks)**

5. (a) Explain the Model-View-Controller pattern that describes the basic possible operation of the MP3 player in the embedded system design.

(b) Explain the functions of the four pieces constituted in the command handler that sends a command between computer and embedded system and illustrate their relationship with the diagram. **(20 marks)**

\*\*\*\*\*END\*\*\*\*\*

**Department of Higher Education**  
**University of Computer Studies, Hinthada**  
**Fifth Year (B.C.Tech.)**  
**Mid-Term Examination**  
**Image Processing and Computer Vision (CT-505)**  
**March, 2018**

**Answer All Questions.**

**Time Allowed: 3 Hours**

- 1.(a) Define the following. (10 marks)
- (i) Image display of a general purpose image processing system
  - (ii) Mass storage
  - (iii) High-level processing on image
  - (iv) Digital image
  - (v) Pixels
- (b) Write down the briefly explanation of the fundamental steps that are included in the digital image processing by using with its organizational structure. (10 marks)
- 2.(a) Write **Short Notes** on the followings. (15 marks)
- (i) Sampling and quantization
  - (ii) How do you represent image in  $M \times N$  numerical array form?
  - (iii) Image operations on a pixel
- (b) (i) Given the conditions under which the  $D_4$  distance between two points  $p$  and  $q$  is equal to the shortest 4- path between these points. (5 marks)
- (ii) Consider the two image subsets  $S_1$  and  $S_2$ , shown in the following Figure. For  $V=\{1\}$ , determine whether these two subsets are (a) 4-adjacent (b) 8-adjacent or (c) m- adjacent.
- |   | $S_1$     | $S_2$   |   |
|---|-----------|---------|---|
| 2 | 0 0 0 0   | 0 0 2 1 | 0 |
| 1 | 0 0 1 0   | 2 1 0 0 | 1 |
| 1 | 2 0 1 1   | 1 1 0 0 | 2 |
| 0 | 0 0 1 1 1 | 0 0 0 0 | 0 |
| 0 | 0 0 1 1 1 | 0 0 1 1 | 1 |
- (5 marks)
- 3.(a) How do you understand on the followings? (15 marks)
- (i) Gray-level slicing
  - (ii) Spatial filtering
  - (iii) Image Averaging
- (b) What is histogram processing in digital image? Explain about the histogram equalization. (10 marks)
- 4.(a) What are the homomorphic filtering approach for image enhancement. (5 marks)
- (b) Describe the two dimensional Discrete Fourier Transform and its inverse function. (10 marks)
- 5.(a) Write the probability density function for Gaussian Noise. (5 marks)
- (b) What is mean filters? How many types of mean filters? Explain **any TWO** of them. (10 marks)

\*\*\*\*\*END\*\*\*\*\*