THE DEPARTMENT OF ADVANCED SCIENCE AND TECHNOLOGY
UNIVERSITIES OF COMPUTER STUDIES, ZONE IV
THIRD YEAR B.C.Sc. / B.C.Tech.
FIRST SEMESTER EXAMINATION
MARCH 2014

Answer all questions. **ENGLISH** **Time allowed: 3 hours**

QUESTION-I

A. International trade is growing at a startling pace. While the global economy has been expanding at a bit over 3% a year, the volume of trade has been rising at a compound annual rate of about twice that. Foreign products, from meat to machinery, play a more important role in almost every economy in the world, and foreign markets now tempt businesses that never much worried about sales beyond their nation's borders.

B. What lies behind this explosion in international commerce? The general worldwide decline in trade barriers, such as customs duties and import quotas, is surely one explanation. The economic opening of countries that have traditionally been minor players is another. But one force behind the import-export boom has passed all but unnoticed: the rapidly falling cost of getting goods to market. Theoretically, in the world of trade, shipping costs do not matter. Goods, once they have been made, are assumed to move instantly and at no cost from place to place. The real world, however, is full of frictions. Cheap labour may make Chinese clothing competitive in America, but if delays in shipment tie up working capital and cause winter coats to arrive in spring, trade may lose its advantages.

C. At the turn of the 20th century, agriculture and manufacturing were the two most important sectors almost everywhere, accounting for about 70% of total output in Germany, Italy and France, and 40-50% in America, Britain and Japan. International commerce was therefore dominated by raw materials, such as wheat, wood and iron ore, or processed commodities, such as meat and steel. But these sorts of products are heavy and bulky and the cost of transporting them relatively high.

D. Countries still trade disproportionately with their geographic neighbours. Over time, however, world output has shifted into goods whose worth is unrelated to their size and weight. Today, it is finished manufactured products that dominate the flow of trade, and, thanks to technological advances such as lightweight components, manufactured goods themselves have tended to become lighter and less bulky. As a result, less transportation is required for every dollar's worth of imports or exports.

E. To see how this influences trade, consider the business of making disk drives for computers. Most of the world's disk-drive manufacturing is concentrated in South-east Asia. This is possible only because disk-drives, while valuable, are small and light and so cost little to ship. Computer manufacturers in Japan or Texas will not face hugely bigger freight bills if they import drives from Singapore rather than purchasing them on the domestic market. Distance therefore poses no obstacle to the globalization of the disk-drive industry.

F. This is even more true of the fast-growing information industries. Films and compact discs cost little to transport, even by aeroplane. Computer software can be 'exported' without ever loading it onto a ship, simply by transmitting it over telephone lines from one country to another, so freight rates and cargo-handling schedules become insignificant factors in deciding where to make the product. Businesses can locate based on other considerations, such as the availability of labour, while worrying less about the cost of delivering their output.

G. In many countries deregulation has helped to drive the process along. But, behind the scenes, a series of technological innovations known broadly as containerisation and inter-modal transportation has led to swift productivity improvements in cargo-handling. Forty years ago, the process of exporting or importing involved a great many stages of handling, which risked portions of the shipment being damaged or stolen along the way. The invention of the container crane made it possible to load and unload containers without capsizing the ship and the adoption of standard container sizes allowed almost any box to be transported on any ship. By 1967, dual-purpose ships, carrying loose cargo in the hold* and containers on the deck, were giving way to all-container vessels that moved thousands of boxes at a time.

H. The shipping container transformed ocean shipping into a highly efficient, intensely competitive business. But getting the cargo to and from the dock was a different story. National governments, by and large, kept a much firmer hand on truck and railroad tariffs than on charges for ocean freight. This started changing, however, in the mid-1970s, when America began to deregulate its transportation industry. First airlines, then road hauliers and railways, were freed from restrictions on what they could carry, where they could haul it and what price they could charge. Big productivity gains resulted. Between 1985 and 1996, for example, America's freight railways dramatically reduced their employment, trackage and their fleets of locomotives – while increasing the amount of cargo they hauled. Europe's railways have also shown marked, albeit smaller, productivity improvements.

I. In America the period of huge productivity gains in transportation may be almost over, but in most countries the process still has far to go. State ownership of railways and airlines, regulation of freight rates and toleration of anti-competitive practices, such as cargo-handling monopolies, all keep the cost of shipping unnecessarily high and deter international trade. Bringing these barriers down would help the world's economies grow even closer.

*hold: ship's storage area below deck

Questions 1-5

Do the following statements agree with the information given in Reading Passage? Write

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. Cheap labour guarantees effective trade conditions.
2. Japan imports more meat and steel than France.
3. Small computer components are manufactured in Germany.
4. Most countries continue to prefer to trade with nearby nations.
5. International trade is increasing at a greater rate than the world economy.

Questions 6-10

Complete the summary using the list of word below.

Modern cargo-handling methods have had a significant effect on trade as the business of moving 6------- around the world becomes increasingly streamlined. Manufacturers of computers, for instance, are able to import components from 7-------, rather than having to rely on a local supplier. The introduction of container ships has meant that bulk 8------- can be safely and efficiently moved over long distances. While international 9------- is now efficient, there is still a need for governments to reduce tariffs in order to free up the 10------- cargo sector.

domestic	cargo	overseas	freight	shipping

QUESTION-II

Fill in the gaps with the correct form of the verbs in brackets using ***present simple*** *or* ***present continuous****. Just write down the number and the answer.*

1. Fiona ..... (watch) television because her favourite film star is on.
2. I ..... (have) my lunch early today as I have an appointment.
3. I ..... (wear) casual clothes at the weekend.
4. The company's financial situation ..... (improve) now that it has a new Chief Executive.
5. I ..... (you/do) the shopping at the same time every week.
6. What ..... (do) to your sister? Leave her alone!
7. Teachers ..... (work) hard but they get long holidays.
8. Serge ..... (think) of retiring early because he isn't happy at work anymore.
9. My cousin ..... (live) in Thailand at the moment.
10. If you heat water to 100 °C, it ..... (boil).

QUESTION-III

Fill in the gaps with the correct form of the verbs in brackets. Just write down the number and the answer.

1. The kettle ..... (boil) now. Shall I make the tea?
2. The sun ..... (shine), put the wet clothes out to dry.
3. It's time up. ..... (stop) waiting everyone!
4. Look! Smoke ..... (come) out of that house.
5. Mike .....(repair) the chair. So it's all right now.
6. I ..... (not/have) a party for ages.
7. Listen! The burglar alarm .....(ring) since 8 o'clock this morning.
8. You .....(play) on that computer since 7o'clock.
9. As we .....(drive) down the hill, a strange object appeared in the sky.
10. While Laura was sitting in the garden, it suddenly .....(begin) to rain.

QUESTION- IV

(A)Describe someone in your family who you like.

You should say:

- how this person is related to you
- what this person looks like
- what kind of person he/she is

and explain why you like this person.

(B) Answer the following questions?

1. What is your favourite dance?
2. Do you enjoy dancing?(Why/Why not?)
3. Has anyone ever taught you to dance? (Why/Why not?)
4. Tell me about any traditional dancing in your country.
5. Do you think that traditional dancing will be popular in the future? (Why/Why not?)

QUESTION-V

Write an ***Essay*** *on the following topic:*

"Childhood is the happiest time of one's life. Do you agree or disagree? Use specific reasons and details to support your answer."

THE END

Department of Advanced Science and Technology

University of Computer Studies

Computer Organization (CST-301)

B.C.Sc./B.C.Tech. (Third Year) First Term Examination

March, 2014

Answer **all** questions — **Zone IV** — Time allowed 3 hours

1. (a) Define **ANY FIVE** the following : **(10 marks)**
   (i) Virtual Machine
   (ii) Computer buses
   (iii) MPC
   (iv) TOS
   (v) CPU chips
   (vi) MDR

   (b) (i) Explain ALU 6 bits work **(4 marks)**
   (ii) Describe Clocked D latches. **(4 marks)**

2. Describe the differences between **ANY FOUR** of the following: **(16 marks)**
   (a) Translator and Interpreter
   (b) ripple carry adder and carry select adder
   (c) master and slave buses
   (d) noninverting and inverting buffer
   (e) Immediate addressing and direct addressing

3. (a) Assume that the new ALU design has performed the four functions A B, A NAND B, A NOR B and A+B (A adds B). There are two control bits F1 and F2 that are control these functions (00, 01, 10, 11 respectively). Draw the diagram for 1 bit ALU to operate these four functions. **(8 marks)**

   (b) Draw the logic diagram for a 4 x 4 memory organization. **(8 marks)**

4. (a) Convert the following java code to IJVM instructions. **(8 marks)**

   (i)
   ```
   r2 = r1;
   r3 = r2 – 1;
   while (r3 <> 0 ) do
   {r2 = r2 + r1;
    r3 = r3 -1;
   }
   ```

   (ii) i = (j – k – 6) + (j – k – 6)

   (b) (i) Consider the 1-bit ALU that can perform one of the followings namely A AND B, A OR B, B and A+B. It also contains six control lines, ENA, ENB, INVA, INC, F0 and F1. How does above ALU produces the following output? In each case, specify the value of six control lines, A+1, B-A, A OR B and 0. **(4 marks)**

   (ii) Draw the logic diagram for 4 Mbits chip using 512K x 8 **(4 marks)**

5. (a) Write the detail of MIR to represent the following IJVM instructions: **(12 marks)**

Label	Operations
Main 1	PC=PC + 1; goto (MBR)
ior1 ior2 ior3	MAR=SP=SP-1; rd H=TOS MDR=TOS=MDR OR H; wr; goto Main1
wide_iload1 wide_iload2 wide_iload3 wide_iload4	PC=PC + 1; fetch H=MBRU << 8 H=MBRU OR H MAR=LV + H; rd; goto iload3
ldc_w1 ldc_w2 ldc_w3 ldc_w4	PC=PC + 1; fetch H=MBRU << 8 H=MBRU OR H MAR= H + CPP; rd; goto iload3

(b) (i) If the circuits were to be 4 x 2 memory, how many AND gates and OR gates of each would be needed? **(3 marks)**

(ii) Consider the timing diagram of a synchronous bus. We will use the 100 MHz clock. It takes 1 nsec for a signal to change. The address output delay is 16 nsec and the data set up time is 5 nsec. How much time read data a word from memory after address line stable? **(3 marks)**

6. (a) Compare 0-, 1-, 2-, and 3- address machine by writing programs to compute
X = A * B + C / D
for each of the four machines. The instructions available for use are as follows: **(12 marks)**

0- Address	1- Address	2- Address	3 -Address
PUSH M	LOAD M	MOV (X = Y)	MOV (X = Y)
POP M	STORE M	ADD (X = X + Y)	ADD (X = Y + Z)
ADD	ADD M	SUB (X = X - Y)	SUB (X = Y - Z)
SUB	SUB M	MUL (X = X * Y)	MUL (X = Y * Z)
MUL	MUL M	DIV (X = X / Y)	DIV (X = Y / Z)
DIV	DIV M		

M is a16 bits memory address and X,Y,Z are either 16 bit addresses or 4 bit registers. Assuming 8-bit opcodes, and instruction lengths that are multiples of 4 bits, how many bits do each machine need to compute X?

(b) Convert the following Infix Boolean formula to reverse Polish notation. **(4 marks)**
(i) ((A + B) * D) / (E - F)
(ii) (A+B*C)/(D-E*F)
(iii) ((A + B) * C + D) / (E + F + G)
(iv) (A * B) + (C * D) + E

Department of Advanced Science and Technology
University of Computer Studies
Third Year (B.C.Sc./ B.C.Tech.)
Mathematics of Computing III (CST 302)
31-3-2014
Zone IV

Answer All Questions. **Time Allowed: 3 hours.**

1. (a) Find the exact differential equation du=0.

(i) $u = \tan(y^2 - x^3)$.

(ii) $u = \frac{1}{4}(x^4 + 6x^2y^2 + y^4)$

(b) Solve the following differential equations.

(i) $2xydx + dy = e^{x^2}, y(0) = 2.$

(ii) $y' + 2y = e^x(3\sin 2x + 2\cos 2x).$

2. Find a real solution and check your answer by substitution.

(i) $y'' - 9\pi^2 y = 0.$

(ii) $y'' + 4y = 0, y(0) = 3, y\left(\frac{\pi}{2}\right) = -3$

(iii) $x^2y'' + 1.25y = 0.$

(iv) $x^2y'' - 2xy' + 2y = 0, y(1) = 1.5, y'(1) = 1.$

3. (a) Find the mean and variance of uniform distribution on [a,b].

(b) Compute the probability of obtaining at least two 'six' in rolling a fair die 6 times.

(c) Let $f(x)=kx^2$ if $0 \le x \le 2$ and 0 otherwise. Find k. Find c_1 and c_2 such that $P(X \le c_1)=0.1$ and $P(X \le c_2)=0.9$.

4. (a) Find the Laplace transforms of the following functions.

(i) $y'' - 4y' + 3y = 6t - 8, y(0) = 0, y'(0) = 0.$

(ii) $y'' + 2y' - 3y = 6e^{-2t}, y(0) = 2, y'(0) = -14.$

(b) Find the inverse Laplace transform by integration.

(i) $\frac{1}{s(s^2+\omega^2)}$ (ii) $\frac{1}{s^3-s}$ (iii) $\frac{9}{s^2} \cdot \frac{s+1}{s^2+9}$

(c) Using convolution, find the inverse h(t) of $H(s)=\frac{1}{(s^2+1)^2}$.

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc. /B.C.Tech. (Third Year)
First Semester Examination (March, 2014)
Data Communication (CST- 303)

Answer ALL Questions **Zone IV** **Time allowed: 3 hours**

1. Define the following terms: **(2 marks each)**
   (a) Simplex
   (b) Earth station
   (c) Signaling rate
   (d) Lost frame
   (e) Data link
   (f) Multiplexing
   (g) Datagram
   (h) Spread spectrum
   (i) Rate based
   (j) MAC

2. Answer ***ANY SIX*** of the followings: **(4 marks each)**
   (a) Define noise. List the categories of noise and explain **two** of them.
   (b) Describe advantages of packet switching over circuit switching.
   (c) What is VSB?
   (d) What are the most common and the most powerful for **error-detecting codes**? Explain briefly.
   (e) What are the station types supported by **HDLC**? Describe each.
   (f) What is FDM?
   (g) Describe general model of spread spectrum Digital Communication System.
   (h) Describe the **two** advantages of **Multiple-stage switch** over **Single-stage crossbar**.
   (i) What is flooding?
   (j) How many types of important congestion control techniques?

3. (a) Describe the principal advantage of **DM** over **PCM**.
   (b) What are the differences between Selective-Reject and Go-Back-N ARQ?
4. (a) Explain about stop- and- wait- flow control.
   (b) Explain any four characteristics of routing function.
5. (a) When network congestion occurs, what happen?
   (b) What is the difference between a **hub** and **layer 2 switch**?

6. Compare and contrast between the three guided media commonly used for followings:
   (i) Physical descriptions
   (ii) Applications
   (iii) Transmission characteristics

(OR)

6. Compare and contrast between **Statistical time division** and **Synchronous time division.** If **a statistical multiplexer** and **a synchronous multiplexer** both use a link of the same data rate, which multiplexer can support more devices? Explain why?

(14 marks each)

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc. (Third Year)
Mid-term Examination
CS-304 (SE+ UML)
April, 2014
Zone IV

Answer all questions. **Time allowed : 3 hours**

SE

1. Write short notes on any Four from the followings: (20 marks)
   (a)Two types of domain-specific architectural model.
   (b)What are the generic services of common object request broker architecture (CORBA)?
   (c)What are the two main advantages to adopting an incremental approach to software development?
   (d)Key features of testing in extreme programming.
   (e) Describe the benefits of using prototyping

2. (a) Describe the five-levels of services in the CASE reference model. (10 marks)

   (b) Explain the basic facilities that must be provided by an object request broker (ORB). (10 marks)

3. Explain why test-first development helps the programmer to develop a better understanding of the system requirement. (10 marks)

   (or)

   Describe the various types of specialization of a software product line.

UML

4. (a) State the four kinds of things which are the basic object-oriented building blocks of the UML and briefly explain them. (8 marks)

   (b) Define the following terms: (8 marks)

   (i) Deployment diagram

   (ii) Object diagram

   (iii) Component diagram

   (iv) Class diagram

   (c) What is the difference between sequence and collaboration diagrams? (4 marks)

5. Consider the world of libraries. A library has books, videos, and CDs that it loans to its users. All library material has a id# and a title. In addition, books have one or more authors, videos have one producer and one or more actors, while CDs have one or more entertainers. The library maintains one or more copies of each library item (book, video or CD). Copies of all library material can be loaned to users. Reference-only material is loaned for 2hrs and can't be removed from the library. Other material can be loaned for 2 weeks. For every loan, the library records the user, the loan date and time, and the return date and time. For users, the library maintains their name, address and phone number. Draw **a class diagram** (or two, if this is more convenient) for the description above. Make sure to show attributes, multiplicities and aggregations/compositions, where appropriate. No need to show any operations.

(14 marks)

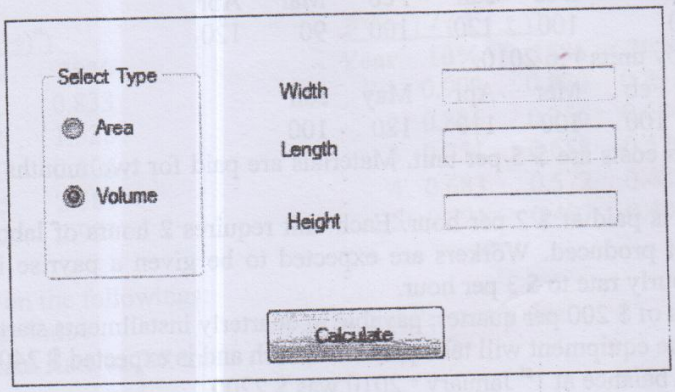
6. The College Street Red Cross Blood Donor Centre operates as follows: On the day of a blood donation, the Donation Unit receives blood donations from donors and sends them to the Testing Unit which tests each blood donation for blood type and potential viral agents. The Testing Unit then sends the blood donation along with test results to the Processing Office (another unit of the Centre) which fills a form for each tested blood unit where the tests are OK, and sends the blood units and forms to the Distribution Office. If tests indicate that a blood unit may be contaminated with a viral agent, the Processing Office destroys that unit.

Draw a **sequence diagram** and **collaboration diagram** for this scenario. (16 marks)

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc. Third Year, Mid Term Examination
CS-305 Computer Application Technique III
March, 2014
Zone IV

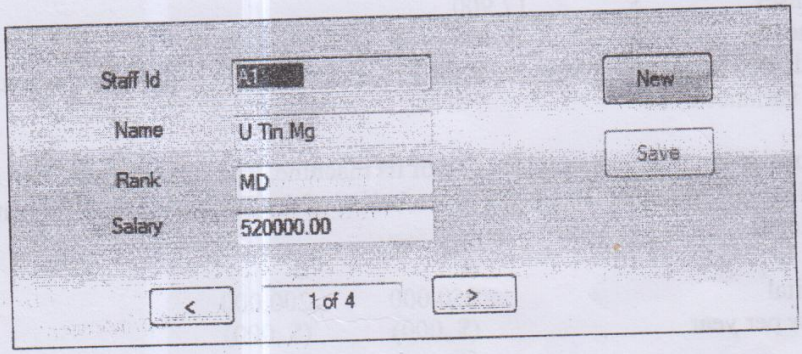
Answer all questions — Time Allowed: 3 hours

1(a). Create a project that includes overloading function procedure named "calculate". The overload function procedure calculates the area of a rectangle if invoked with **two arguments** or calculates the volume of box if invoked with **three arguments**. The Calculate button called the overload function procedure with suitable arguments and display the result with message box. At the start of form, the 'Area' radio button is selected so that two labeled text boxes are visible but one labeled text box (for height) is not visible. When user selects 'Volume', all labeled text boxes are visible. Write property setting for the form's elements. (15 marks)



(b) Write a program to calculate the interest for given amount, period and rate. Your program will call a user defined function "inter()" that will take three arguments(amount, period, rate) and returns the interest value as decimal. (5 marks)

2(a). Create a project that uses **BindingContext and CurrencyManager.** It can navigate by using two navigation buttons. It can also insert a new record into the staff_Info table. When user navigating the records, the 'Save' button is disabled. If user clicks the 'New' button, this will be enabled. The staff_info table has staff_Id, name, rank and salary fields. (15 marks)



(b) Create a project that deletes the students who are failed in exam by using data adapter object's selectcommand property. Use 'Marks' table with rno, p1, p2, total and result fields in 'Students' database. (5 marks)

3(a). Create a project that displays the student(s) record in a message box. The program search the students' names started with the user desired character. Use students table with rno, sname, dob and address fields in Students database. (Write the code by using dataset and datatable object.)
(5 marks)

(b). Create a project that updates the address of the student(s) record with new address according to user enters roll no. Use students table with rno, sname, dob and address fields in Students database. (Write the code by using sqlcommand objects.) (5 marks)

4(a). Draw up the Cash Budget for the months from January to April using the following information:

(i) Sales : at $ 16 per unit : 10% of sales are for cash and the remainder are on credit : debtors pay in three months after sales;

Sales (by units);

2009		**2010**				
Oct	Nov	Dec	Jan	Feb	Mar	Apr
100	90	100	120	100	90	120

(ii) Production (by units) in 2010.

Jan	Feb	Mar	Apr	May	Jun
120	100	100	110	120	100

(iii) Raw materials costs are $ 5 per unit. Materials are paid for two months before being used in production.

(iv) Direct labour is paid at $ 2 per hour. Each unit requires 2 hours of labour. Paid in the same months as unit produced. Workers are expected to be given a payrise in March which will increase the hourly rate to $ 3 per hour.

(v) Fixed expenses of $ 200 per quarter; payable in quarterly installments starting in January.

(vi) A sales of some equipment will take place in March and is expected $ 2400.

(vii) Opening cash balance at 1st January ' 2010 was $ 2200. (10 marks)

(b). A firm has estimated that it will be able to sell 10,000 units in the coming year. The selling price per unit has been set at $ 12.
Materials will cost $ 3 per unit and labour $ 2.50 per unit. The firm has identified Direct Expenses of $ 1.50 per unit and also predicts Fixed Overheads of $ 4,000 for the year.
At the end of the year the actual result are as follows;

Sales (11500 units)	$	135,500
Materials	$	38,500
Labour	$	26,500
Direct Expenses	$	17,900
Fixed Overheads	$	4,100

Draw up the budgeted profit and loss account for the year, a flexible budget for the actual sales level and identify the variances. (10 Marks)

5(a). Golden construction intends to replace one of its machine. The final decision will be based entirely on financial grounds. Details are given below of the alternative replacement machine being considered.

Machine		A	B
cost of capital		250,000	200,000
Cash inflow per year		($,000)	($,000)
Year	1	60	75
	2	120	75
	3	100	65
	4	60	65
	5	40	65

Salvage value at life

Year 5 30 -

It also additional expenses to machine B for extension system $10,000 for year 1 and year 2, at beginning of the project.

It is intended to choose only one of the machine and to finance 1/3 of all capital with loan and 2/3 with equity. Assume also the cost of financing with Loan 14% and 15% of equity.

Required:

(a) The weighted average cost of capital.

(b) NPV for each machine. Which machine should be accepted or rejected, why?

(c) Calculate the Internal Rate of Return and the Pay-back period for accepted machine.

(20 marks)

Notes:

Present value of an ordinary annuity of $ 1 is:

$PV = 1/r * (1 - 1 / (1+r)^n)$

Year	10%	15%	20%
1	0.909	0.870	0.833
2	1.736	1.626	1.528
3	2.487	2.283	2.106
4	3.170	2.855	2.589
5	3.791	3.352	2.991

$PV = 1 / (1 + r)^n$

Year	10%	15%	20%
1	0.909	0.870	0.833
2	0.826	0.756	0.694
3	0.751	0.658	0.579
4	0.683	0.572	0.482
5	0.621	0.497	0.402

(b) Write short notes on the followings: (10 marks)

(i) The Present Value

(ii) The Net Present Value

(iii) The Internal Rate of Return

(iv) The Payback

Department of Advanced Science and Technology
University of Computer Studies
Artificial Intelligence (CS-306)
B.C.Sc. Third Year, First Term Examination
March 2014
Zone IV

Answer **all** questions — Time allowed 3 hours

1. (a) Define the followings **(10 marks)**
   (i) Agent Program
   (ii) Fringe
   (iii) Commutativity
   (iv) Backtracking Search
   (v) Alpha-Beta Pruning.

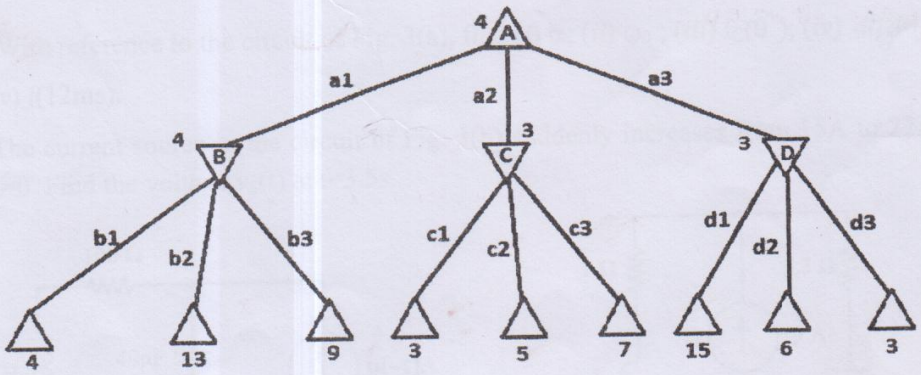
   (b) Distinguish between **(10 marks)**
   (i) Stochastic hill climbing and first-choice hill climbing
   (ii) Search cost and Total cost

2. (a) Write short notes on followings: **(15 marks)**
   (i) Recursive Best-First Search(RBFS)
   (ii) Measuring Problem Solving Performance
   (iii) Depth-Limited Search
   (b) List and explain the components to represent a node. **(5 marks)**

3. (a) (i) Write two key advantages of local search algorithm. **(15 marks)**
   (ii) Explain evaluation functions. How exactly do we design good evaluation functions?
   (iii) How to define a game as a kind of search problem.
   (b) Draw the optimal decisions of three ply of a game tree with three players (A,B,C).**(5 marks)**

4. (a) Write the Genetic algorithm with examples. **(10 marks)**
   (b) Give the characteristics of task environment for the following: **(10 marks)**
   (i) Automated taxi driving
   (ii) Medical Diagnosis System

5. (a) Draw a general model of learning agents and discuss about it. **(10 marks)**
   (b) Draw the stages in the calculation of the decision for the root of the given game tree by using alpha-beta pruning. **(10 marks)**



Department of Advanced Science and Technology
University of Computer Studies
Third Year (B.C.Tech.)
Mid Term Examination
Electronic I (CT 304)
March, 2014
Zone IV

Answer all questions. **Time allowed: 3 hours**

1(a) Determine the output voltage waveform for each circuit in Figure 1(a).

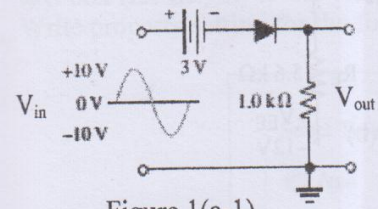


Figure 1(a-1)

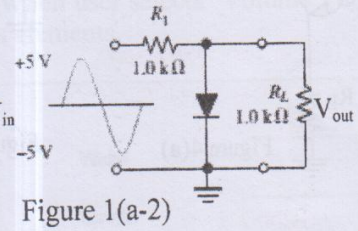


Figure 1(a-2)

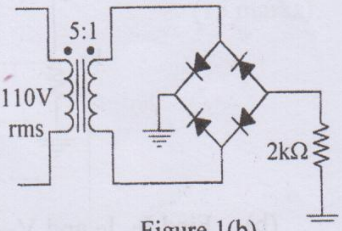


Figure 1(b)

(b) Consider the circuit in Figure 1(b).

(i) What type of circuit is this?

(ii) What is the total peak secondary voltage?

(iii) Find the peak voltage across each half of the secondary.

(iv) Sketch the voltage waveform across R_L.

(v) What is the peak current through each diode?

(vi) What is the PIV for each diode?

2(a) A 120Hz full-wave rectified voltage with a peak value of 50V is applied to the LC filter in Figure 2(a) with L = 300 mH, R_w = 50Ω, C = 100μ F and R_L = 10kΩ. Determine the filter output in terms of its dc value and the rms ripple voltage.

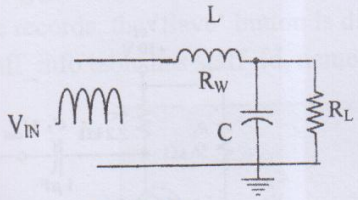


Figure 2(a)

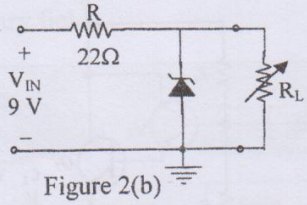


Figure 2(b)

(b) A loaded zener regulator is shown in Figure 2(b). V_Z=5.1 V at I_Z = 49mA, I_{ZK} = 1mA, Z_Z=7Ω, and I_{ZM} = 70mA. Determine the minimum and maximum permissible load currents.

3(a) The LED in Figure 3(a) requires 30mA to emit a light. Sketch the waveform of the square wave input voltage (with amplitude) necessary to make sure that the transistor saturates. Find the actual LED current.

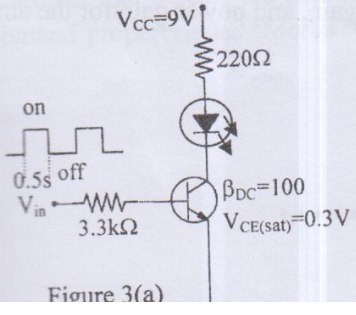


Figure 3(a)

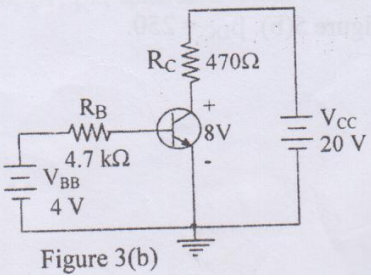


Figure 3(b)

(b) Determine each current in Figure 3(b). What is the β_{DC}?

4(a) Find I_C and V_{CE} for a pnp transistor circuit with these values: R_1=68kΩ, R_2=47kΩ, R_C = 1.8kΩ, R_E=2.2 kΩ, V_{CC} = -6V, and β_{DC} = 80. Refer to Figure 4(a), which shows the schematic with a negative supply voltage.

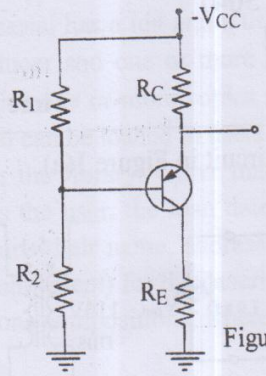


Figure 4(a)

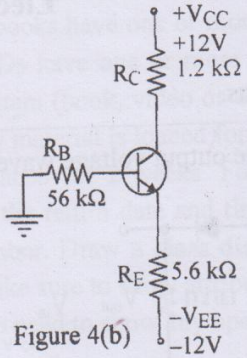


Figure 4(b)

(b) Find I_C, I_E and V_{CE} in Figure 4(b) for β_{DC}=100. Draw the dc load line showing the Q point. Determine how much Q-point will change over the temperature range where β_{DC} increases from 100 to 120 and V_{BE} decreases from 0.7V to 0.6V.

5(a) In Figure 5(a) for the common-emitter amplifier, V_{CC}=12V, R_C = 1.0kΩ and r_e'=5Ω. For the Darlington emitter-follower, R_1=10kΩ, R_2 = 22kΩ, RE = 22Ω, R_L = 8Ω, V_{CC} = 12 V, and $\beta_{DC} = \beta_{ac}$ = 100 for each transistor. Neglect $R_{IN\ (BASE)}$ of the Darlington.

For the Darlington emitter-follower,

(i) Determine the voltage gain of the common-emitter amplifier.

(ii) Determine the voltage gain of the Darlington emitter-follower.

(iii) Determine the overall voltage gain and compare to the gain of the common-emitter amplifier driving the speaker directly without the Darlington emitter-follower.

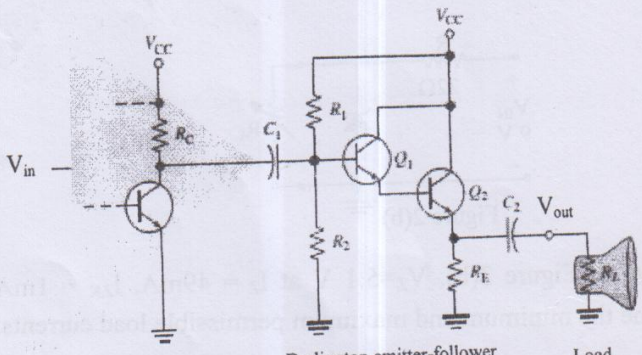


Figure 5(a)

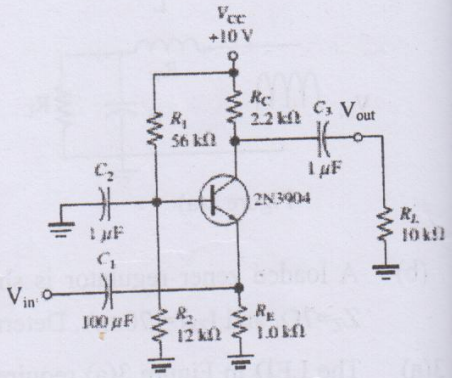


Figure 5(b)

(b) Find the input resistance, voltage gain, current gain, and power gain for the amplifier in Figure 5(b). β_{DC} = 250.

****

Department of Advanced Science and Technology
University of Computer Studies
Third Year (B.C.Tech.)
Mid-Term Examination
Linear Control (CT 305)
March, 2014

Zone IV

Answer all questions. **Time allowed: 3 hours**

1(a) Determine the closed-loop transfer function T(s) = Y(s)/R(s) for the system of Figure 1(a).

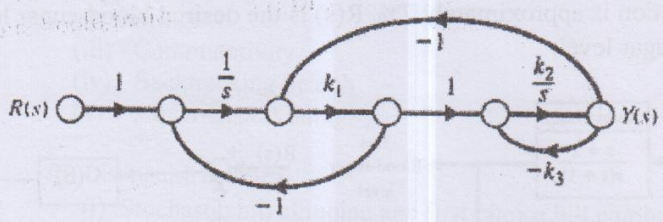


Figure 1(a)

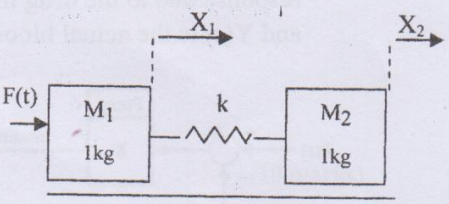


Figure 1(b)

(b) Determine the transfer function $X_2(S)/F(S)$ for the system show in Figure 1(b). Both masses slide on a frictionless, and k=1N/M

2(a) Determine the transfer function, $V_o(s)/V(s)$ for the op-amp circuit shown in Figure 2(a). Assume an ideal op amp.

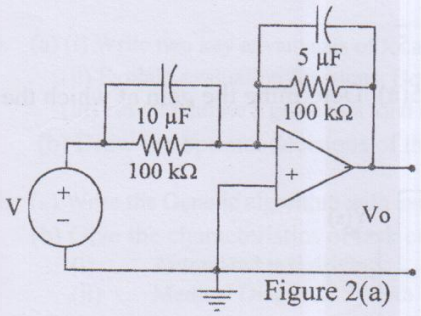


Figure 2(a)

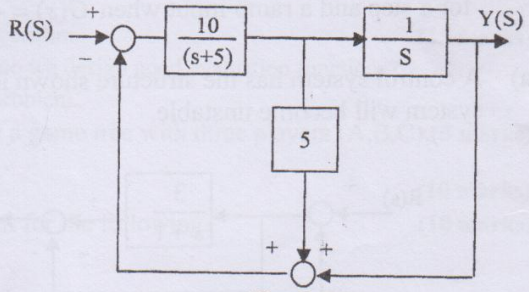


Figure 2(b)

(b) The block diagram of a system is shown in Fig 2-b Determine the transfer function T(S)=Y(S)/R(S).

3(a) A closed-loop system is used to track the sun to obtain maximum power from a photovoltaic array. The tracking system may be represented by Figure 3(a) with H(s) = 1 and $G(s)=\frac{100}{\tau s+1}$, where τ = 3 seconds nominally, (a) Calculate the sensitivity of this system for a small change in τ. (b) Calculate the time constant of the closed-loop system response.

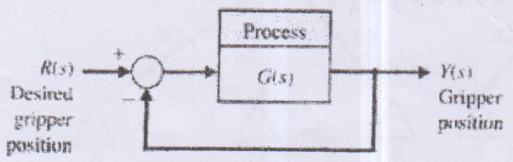
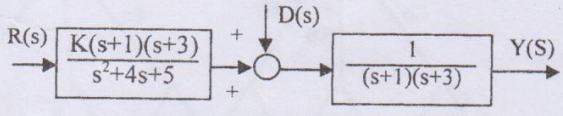


Figure 3(a)



Without feedback

Figure 3(b)

(b) The solar-powered Mars rover can be controlled from earth by sending its path commands, $r(t)$. This system may be operated without feedback as shown in Figure 3(b).

(i) Find transfer functions for the open-loop

(ii) Find also sensitivities of these systems.

(iii) Determine the output responses for the open-loop systems with a unit step disturbance and a unit ramp path command input when K=2.

4(a) Effective control of insulin injection scan result in better lives for diabetic persons. Automatically controlled insulin injection by means of a pump and a sensor that meas ures blood sugar can be very effective. A pump and injection system has a feedback control as shown in Figure 4(a). Calculate the suitable gain K so that the overshoot of the step response due to the drug injection is approximately 7%. R(s) is the desired blood-sugar level and Y(s) is the actual blood sugar level.

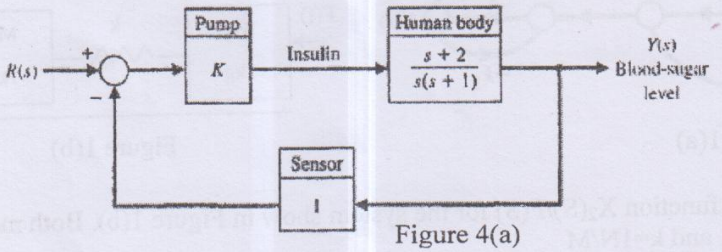


Figure 4(a)

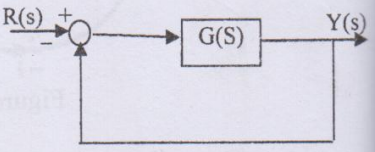


Figure 4(b)

4(b) For the system with unity feedback shown in Figure 4(b), determine the steady-state error for a step and a ramp input when $G(s) = \dfrac{20}{s^2 + 14s + 5}$

5(a) A control system has the structure shown in Figure 5(a). Determine the gain at which the system will become unstable.

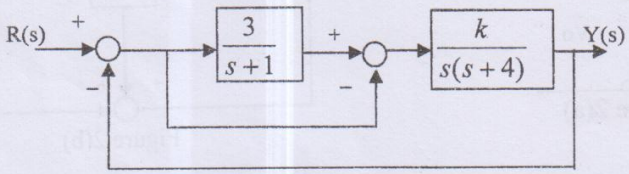


Figure 5(a)

(b) A system has a characteristic equation $s^3 + Ks^2 + (1+K)s + 6 = 0$. Determine the range of K for a stable system.

* * * * * * * * * * * * * * *

Department of Advanced Science and Technology
University of Computer Studies
Third Year (B.C.Tech.)
First Semester Examination
Electrical Circuits II (CT 306)
March, 2014

Answer all questions. **Zone IV** **Time allowed: 3 hours**

1.(a) The switch of Fig. 1(a) has been open for a long time before it closes at t=0. For the time interval $-5 < t < 5$ μs, sketch: (*i*) $i_L(t)$, (*ii*) $i_x(t)$.

(b) Determine both i_1 and i_L in the circuit shown in Fig. 1(b).

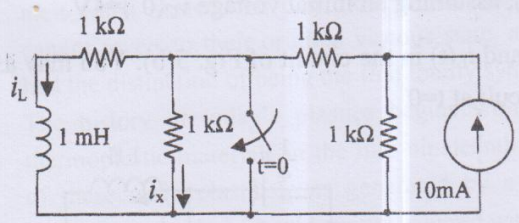


Fig. 1(a)

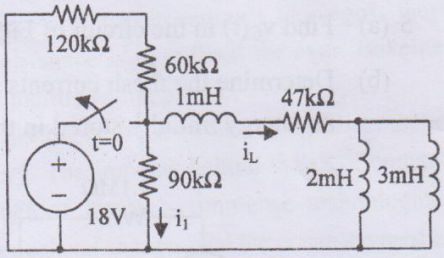


Fig. 1(b)

2 (a) For the circuit of Fig. 2(a), find $v_c(t)$ at t equal to (*i*) 0^-; (*ii*) 0^+; (*iii*) α ; (*iv*) 0.09 s.)

(b) Find $v_c(t)$ after t=0 in the circuit of Fig. 2(b).

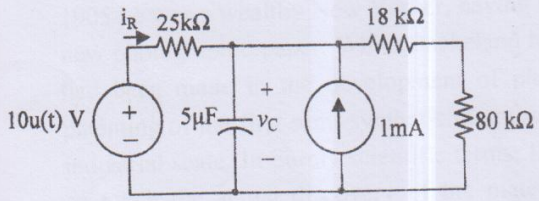


Fig. 2(a)

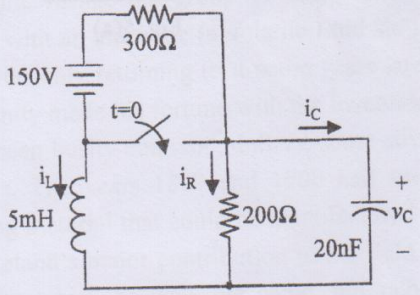


Fig. 2(b)

3 (a) With reference to the circuit of Fig. 3(a), find (*i*) α; (*ii*) ω_0 ; (*iii*) $i_C(0^+)$; (*iv*) $di/dt\big|_{t=0}$; (*v*) *i*(12ms).

(b) The current source in the circuit of Fig. 3(b) suddenly increases from 15A to 22A at t=0. Find the voltage $v_S(t)$ at t=3.5s.

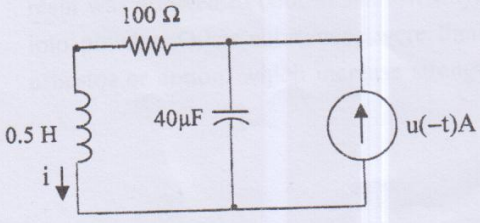


Fig. 3(a)

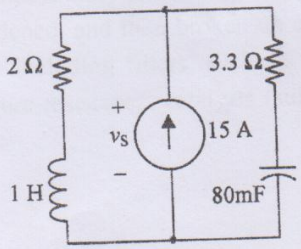


Fig. 3(b)

4 (a) Let $v_s=10e^{-2t}\cos(10t+30°)$V in the circuit of Fig. 4(a), and work in the frequency domain (*i*) find $\mathbf{I_X}$, (*ii*) Find $i_x(t)$.

(b) Given the series RL circuit shown in Fig. 4(b), find the current through the 4Ω resistor.

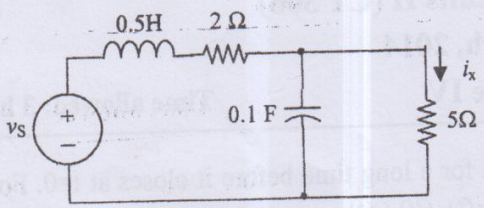


Fig. 4(a)

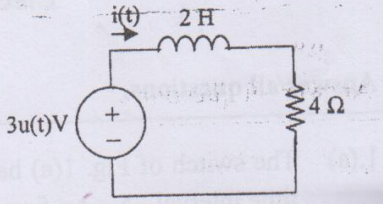


Fig. 4(b)

5 (a) Find $v_C(t)$ in the circuit of Fig. 5(a), assuming an initial voltage $v_C(0^-)=4$V.

(b) Determine the mesh currents $i_C(t)$ and $i_L(t)$ in the circuit of Fig. 5(b). You may assume no energy initially stored in the circuit at $t=0^-$.

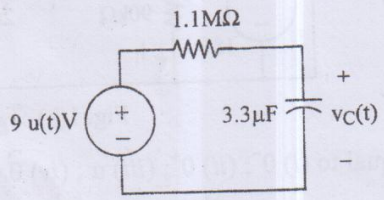


Fig. 5(a)

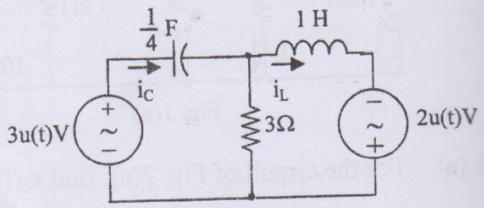


Fig. 5(b)