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MINISTRY OF SCIENCE AND TECHNOLOGY
THE DEPARTMENT OF ADVANCED SCIENCE AND TECHNOLOGY
UNIVERSITIES OF COMPURER STUDIES
HONOURS (B.C.Sc. / B.C.Tech.)
FIRST TERM EXAMINATION
MARCH, 2013
ENGLISH

Answer All Questions.

Time allowed: 3 hours.

QUESTION-I

Our distant ancestors led pretty simple lives. Until around 10,000BC, all humans were hunter-gatherers and lived a nomadic life, searching endlessly for food. It was the development of agriculture that enabled humans to settle down and live, first as farmers and then as villagers. Around 3500BC, small towns began appearing in Mesopotamia, surrounded by defensive high walls and irrigated fields that fed the town's population.

In the thousand years that followed, when agriculture had become more of a science and crop yields had risen, fewer people were needed to produce food. People took other jobs, became wealthier and more and more chose to live in towns close to shops and markets. This worked well for centuries. Towns flourished and eventually one of the grandest, Rome, became the world's first city of more than one million people around 100AD.

Although the fertile lands surrounding Rome could have adequately fed the city, the Roman people began importing food and became reliant on long supply chains. When Gaiseric the Vandal began withholding vital North African grain supplies from Rome in 455AD, the city's power went into steep decline. The Dark Ages that ensued saw people deserting cities across Europe and returning to the countryside.

Make it accessible

It was not until 1200AD that people began flocking back to the cities, a trend encouraged by the growth of iron technology and further improvements in agriculture. Cities and towns began to spring up across Europe and Asia.

The main factor which determined where a city was founded, according to Derek Keene, Director of the Centre for Metropolitan History at the University of London's Institute of Historical Research, was simple geography. "Was it accessible to people who wished to trade there or bring in supplies?"

However, there were other important considerations. "A city might be successfully founded in a desert if there was a need for a staging post or an interchange on a trade route," he says. Then there were the simple demands of a ruler's ego, or a need to defend people against invaders. Finally, there was one other major motivating force: religion. "A sacred site attracts many visitors who require service," Keene says.

In medieval times, cities grew to exploit trade routes. Bruges in Belgium became rich by weaving wool from Britain. Florence, too, prospered from its wool industry until banking came to dominate its economy.

Constantinople became by far Europe's largest city and premiere trading centre, the true heir to the Roman legacy during the Middle Ages. The gateway between the Eastern Mediterranean, India and Africa on one side and Europe on the other.

Constantinople played a crucial role in the trade of Eastern riches for Western wool and heavy iron products. At the same time, Venice was prospering thanks to trade, its proximity to the sea, Africa and the treasures of Persia. The city-state traded luxury goods such as precious stones, spices, silks and ivory.

Cities that broke the rules

The lure of trading riches has encouraged the growth of cities in unlikely locations. When the East India Trading Company needed a base with good access to the Ganges Valley, it founded Calcutta on swamp land. The site was the furthest inland point that could be reached by ocean-going ships, and the city has grown to a population of 15.5 million today.

The most ludicrously located city has to be St. Petersburg, built as the capital of a vast empire by Peter the Great. Thousands of slave labourers died during its construction, and he had to force people to live there.

Other major world capitals had no such problems. London, founded in 50AD, grew steadily and is the least planned world city, with snobbery playing a large part in determining its layout. Mainline stations are dotted around the periphery of inner London, as wealthy 19th - century residents refused construction of a giant central London rail terminal.

By the 1930s, US architect, Frank Lloyd Wright, was arguing that city size should be limited. But as Wright's treatise was published, New York was becoming the world's first city with a population of ten million, and cities have since grown at an astonishing rate - Mexico City is home to 16.5 million people and 26.9 million now live in Tokyo.

Questions 1-9

Look at the following descriptions (1-9) and the list of cities below. Match each description to one of the cities in the text.

1. became an important centre for banking
2. was the largest city in the world in the 1930s
3. had one main industry, weaving, in the Middle Ages
4. was built on unsuitable land but has developed into a major world city
5. was Europe's most powerful city in the Middle Ages
6. has inconvenient rail connections
7. lost its power and influence rapidly when it suffered food shortages
8. cost many lives to build
9. grew into a successful trading city because of its location close to the sea.....

List of Cities

- | | | |
|-----------|-------------|-------------------|
| A. Rome | D. Florence | G. St. Petersburg |
| B. Venice | E. Bruges | H. Constantinople |
| C. London | F. Calcutta | I. New York |

Questions 10-15

Look at the first five paragraphs and find the words and phrases from the text that mean the following expressions.

10. depended on 10.....
11. followed 11.....
12. migrating back 12.....
13. abandoning 13.....
14. convenient to get to 14.....
15. started developing 15.....

QUESTION-II

Discuss the following questions.

1. Why is it a good idea for a child to have a hobby?
2. Do young people get enough physical exercise these days? Why?/ Why not?
3. Is watching television a good way of relaxing? Why?
4. What leisure activities would you recommend as a way of combating stress?
5. What problems do you see in children spending a lot of time playing video games?

QUESTION-III

Complete the second sentence so that it has a similar meaning to the first. Use the word in brackets.

1. Scott is a resident of Washington. (lives)
.....
2. I'm travelling to Italy as part of my job. (business)
.....
3. Friday morning is a busy time for me. (I'm)
.....
4. They started playing an hour ago. (been)
.....
5. Jonathan can play tennis very well. (good)
.....
6. I'm rather busy now. (moment)
.....
7. We took a plane to Budapest. (air)
.....
8. Nigel passes the newsagent's every day. (goes)
.....
9. The company is planning to reduce the workforce. (reduction)
.....
10. We got to our guest-house early enough for a meal. (time)
.....

QUESTION-IV

Identify and correct the errors.

1. Is there anything on the television tonight?
2. I'd rather stay at home and see television.
3. Did you hear the radio last night?
4. You must be concentrated in your work.
5. Be quiet. I need to concentrate myself.

6. I enjoy listening jazz.
7. I wanted to learn to play guitar.
8. We had a match of football.
9. We have a ten years old daughter.
10. They fought the case for years, but at the end they lost.
11. In the end of the course there is a test.
12. I've written the half of my essay.
13. We've only got half of a kilometre to go.
14. One of the most important things in life is a good health.
15. At first, the machine must be switched on.

QUESTION-V

Complete the following sentences with **adjectives ending in - al** which are derived from the following words. Make any spelling changes necessary.

substance	finance	commerce	confidence	practice
region	industry	liberate	environment	accident

1. The unions are threatening to takeaction unless their pay claim is met.
2. The government has given the company a aid package worth £2 million.
3. Of all the British accents, I think Scottish is my favourite.
4. There has been a increase in confirmed cases of malaria in the area.
5. Tourism, the world's biggest industry, is responsible for much damage.
6. This information is strictly, and I must ask you not to pass it on.
7. We need people who are licensed to drive vans and other vehicles.
8. drug laws have made the Netherlands a gateway for the narcotics trade.
9. We must be..... . It's no good buying a house we cannot afford.
10. Police do not know if the explosion was or caused by a bomb.

QUESTION – VI

Write *An Essay* on the following topic:

“A person's childhood years are the most important years of a person's life.”

Do you agree or disagree with this statement? Use specific reasons and examples to support your answer.

THE END

Department of Advanced Science and Technology

University of Computer Studies

B.C.Sc.(Honours)

Mid-Term Examination

Operations Research (CS-401)

March, 2013

Answer ALL Questions.

Time Allowed: 3 hours.

1. The manager of an oil refinery must decide on the optimal maximum of two possible blending processes of which input and output per production run are given as follows:

Process (Units)	Input (Units)		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amount available of crude A and B are 200 units and 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profit per production run from process 1 and process 2 are Rs.300 and Rs.400 respectively. Formulate this problem as a linear programming model.

2. Solve the following LP problem using the Simplex Method.

$$\text{Max } Z = 5x_1 + 3x_2$$

subject to

$$x_1 + x_2 \leq 2$$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12$$

$$\text{and } x_1, x_2 \geq 0$$

3. Use the penalty (Big-M) method to solve the following LP problem.

$$\text{Minimize } Z = 5x_1 + 3x_2$$

Subject to

$$2x_1 + 4x_2 \leq 12$$

$$2x_1 + 2x_2 = 10$$

$$5x_1 + 2x_2 \geq 10$$

$$\text{and } x_1, x_2 \geq 0$$

4. Obtain an optimal solution, if any, to the following primal LP problem and deduce form it the solution to the dual LP problem.

(a) Maximize $Z = 6x_1 + 5x_2 - 3x_3 - 4x_4$

Subject to $2x_1 + 3x_2 + 2x_3 - 4x_4 = 24$

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 + 2x_3 + 3x_4 \leq 15$$

$$x_2 + x_3 + x_4 \leq 8$$

And $x_1, x_2, x_3, x_4 \geq 0$

(b) Minimize $Z = 4x_1 + 2x_2$

Subject to $2x_1 + 2x_2 \geq 1$

$$x_1 + 2x_2 \geq 1$$

$$2x_1 + x_2 \geq 1$$

And $x_1, x_2 \geq 0$

5. A company wants to produce three products A, B and C. The unit profits on these products are Rs 4, Rs 6 and Rs 2 respectively. These products require two types of resources, manpower and raw material. The LP model formulated for determining the optimal product mix is as follows:

Maximize $Z = 4x_1 + 6x_2 + 2x_3$

Subject to the constraints

(i) Manpower constraint: $x_1 + x_2 + x_3 \leq 3$

(ii) Raw material constraint: $x_1 + 4x_2 + 7x_3 \leq 9$

and $x_1, x_2, x_3 \geq 0$

where x_1, x_2, x_3 = number of units of product A, B and C respectively to be produced

- Find the optimal product mix and the corresponding profit to the company.
- Find the range on the profit contribution of product C (i.e. coefficient c_3 of variable x_3) in the objective function such that current optimal product mix remains unchanged.
- What shall be the new optimal product mix when profit per unit from product C is increased from Rs 2 to Rs 10?

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc./B.C.Tech. (Honours)
Mid Term Examination
Mathematics of Computing (CST-402)
March, 2013

Answer ALL Questions.

1.(a) Solve the following linear system by using Cramer's rule

Time Allowed: 3 hours.

$$3x + 7y + 8z = -13$$

$$2x + 9z = -5$$

$$-4x + y - 26z = 2$$

(b) Find the eigenvalues and eigenvectors of the matrix

$$\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$$

2. Let $A = \begin{bmatrix} -4 & 0 \\ 0 & 2 \end{bmatrix}$, $P = \begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$. Then A has eigenvectors $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$. Find $\hat{A} = P^{-1}AP$, and eigenvectors \underline{y} of \hat{A} . Show that $\underline{x} = P\underline{y}$ are eigenvectors of A .

3.(a) Is A Hermitian or skew-Hermitian? Find $\underline{x}^T A \underline{x}$.

$$A = \begin{bmatrix} 4 & 3-2i \\ 3+2i & 4 \end{bmatrix}, \underline{x} = \begin{bmatrix} -2i \\ 1+i \end{bmatrix}.$$

(b) Find the symmetric coefficient matrix C of the quadratic form $Q = \underline{x}^T C \underline{x}$ given by

$$(i) 4x_1^2 - 8x_1x_2 + 5x_2^2 \quad (ii) (x_1 - x_2)^2 - 4x_3^2$$

4. Find out what type of conic section is represented by the given quadratic form. Transform it to principal axis.

$$Q = \underline{x}^T A \underline{x} = 7x_1^2 + 6x_1x_2 + 7x_2^2 = 200$$

5.(a) Show that the sequence $\left\{ \frac{i^n}{n} \right\}$ is convergent with limit zero and the sequences $\{i^n\}$ and $\{(1+i)^n\}$ are divergent.

(b) Is the sequence $z_n = x_n + iy_n = 1 - \frac{1}{n^2} + i(2 + \frac{4}{n})$ convergent? Find the limit point?

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc. (Hons:)
CS – 403 (Analysis of Algorithm)
First Term Examination
March 2013

Answer All questions.

Time allowed : 3 hours.

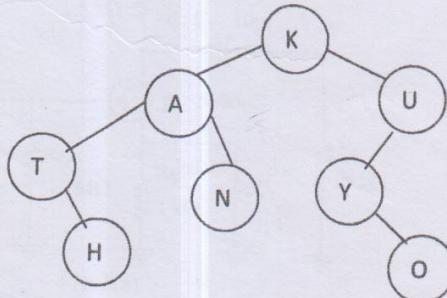
1. (a) Define the **four** of the following :
(i) Worst-case complexity (ii) Accumulator (iii) Expected space complexity
(iv) Recursion (v) Depth of a vertex

(b) Briefly explain **two** of the following:
(i) Turing machine
(ii) Dynamic Programming
(iii) List representation of a Set

(c) Describe the straight-line program to evaluate the factorial
$$n! = n * (n-1) * (n-2) * \dots * 2 * 1$$
2. (a) Give Pidgin ALGOL and RAM program to compute n^n using addition (only ADD instruction).

(b) Analyze the time and space complexity of your RAM program under (i) uniform and (ii) logarithmic cost criteria.
3. (a) Give a Turing Machine which prints 0^{2n^2} on tape 2 when started with 0^n on tape 1.
Analyze time and space complexity of it.

(b) Write the sequence of bit operations to compute the addition of 3-bit integers and draw the logic circuit.
4. (a) Define recursion. What will be the advantages of using recursion? Consider the following binary tree with symbols attached to the vertices. Find the NUMBER array of these vertices by using the recursive procedure for *inorder* traversal.



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 (b) Find the minimal number of operations in multiplying the following matrices using the given dynamic programming algorithm. Also find the order of execution to multiply.

M= M1 * M2 * M3 * M4
 [20 x 10] [10 x 30] [30 x 100] [100 x 1]

begin

```

7. for i=1 until n do mii = 0;
8. for l=1 until n-1 do
begin
9.   for i = 1 until n-l do
begin
10.    j = i + l;
11.    mij = MINi<=k<=j (mik + mk+1,j + ri-1 * rk * rj
    );
end;
12.  write mij;
end;
end

```

5. (a) Prove that the lexicographic sort (fixed-length) algorithm sorts a length n sequence of k -tuples, where each component of a k -tuple is an integer between 0 and $m-1$, in time $O((m+n)k)$.
- (b) Use the lexicographic sort algorithm to sort the strings *abcd*, *bc*, *bbc*, *acc*, *baca*, *d*, *cd*, *cab* *bad*.
- (c) Complete the proof that QuickSort requires $O(n \log n)$ time to sort the sequence of n numbers.



Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc.(Honours) , Mid Term Examination
Paper CS-404 (Database Management System)
April, 2013

Answer all questions.

Time Allowed : 3 hours

I. Write a short note on ANY FIVE of the following. (25 marks)

- (i) Trigger Procedure
- (ii) Grant and Revoke
- (iii) Golden Rule
- (iv) Cross tabulations
- (v) Data Warehouses
- (vi) Temporal database and Temporal data
- (vii) Multi-level Security

II. Consider the following database:

Suppliers {S#, SNAME, STATUS, CITY}
Parts {P#, PNAME, COLOR, WEIGHT, CITY}
Project{J#, JNAME, CITY}
SPJ{S#, P#, J#, QTY}

(a) Using appropriate syntax, define security constraints as necessary to give: (8 marks)

- (i) User Smith can RETRIEVE privilege over supplier information, but only for supplier who supply some part stored in Rome.
- (ii) User Nash and User Todd can RETRIEVE and DELETE privileges over the supplier who lived in Paris.
- (iii) User Ford can RETRIEVE privileges over total shipment quantities per supplier.
- (iv) User Pope can UPDATE privilege over status and city attributes.

(b) Using the appropriate syntax, write integrity constraints. (10 marks)

- (i) All red parts must weigh less than 90 pounds.
- (ii) The highest status supplier must not be located in the same city as the lowest status supplier.
- (iii) At most one supplier can be located in Athens at any one time.
- (iv) Every London supplier must supply part 'P2'.
- (v) No two project can be located in the same city.

III.(a) What are the twelve objectives of distributed database system and briefly explain any two of them. (10 marks)

(b) Write a short note R* object naming and Global deadlock situation in distributed database. (10 marks)

IV.(a) Why data encryption is needed? Describe the details of the encryption algorithm with the following:

Plaintext: I AM A STUDENT

Encryption key: CASTY

(b) Briefly explain the load operation in decision support database. (10 marks)

V. (a) Discuss the scalar operators on intervals of temporal database. (9 marks)

(b) Discuss the online analytical processing queries using ROLLUPS and CUBE operations. (10 marks)

Department of Advanced Science and Technology
University of Computer Studies
B.C.Sc(Hons:), Mid-Term Examination
CS-405 (Software Engineering)
April, 2013

Answer all questions.

Time allowed: 3 hours

-
- I. Answer **any four** of the followings: (20 marks)
- (i) State the verification and validation confidence level.
 - (ii) Describe three classes of process metric that are related to the process activities.
 - (iii) Difference between forward engineering and software re-engineering. Explain it.
 - (iv) Discuss about defect testing.
 - (v) Explain the techniques of system checking and analysis that are used in verification and validation process
- II. (a) Briefly explain why verification and validation plan of a software project should be made available to the developer early on? (10 marks)
- (or)
- Discuss five key characteristics of Cleanroom approach to software development.
- (b) Capability assessment is a questionnaire based process. Discuss about the capability assessment process. (10 marks)
- III. (a) Write short notes for **any two** of the followings: (10 marks)
- (1) Black-Box Testing
 - (2) Stress Testing
 - (3) Top-down and Bottom-up Testing
- (b) Process improvement is a long-term and iterative process. Explain key stages in the process improvement process. (10 marks)
- (or)
- The SEI model classifies software process into five different levels. Define these five levels.
- IV. (a) Describe about an overview of maintenance process and state the reasons for arising urgent changes. (10 marks)
- (or)
- Explain source code translation process in software re-engineering.
- (b) Discuss the approach to data re-engineering. (10 marks)
- V. (a) Briefly describe the activities in software re-engineering process. (10 marks)
- (or)
- Software maintenance is the general process changing a system after it has been delivered. Discuss different type of software maintenance.
- (b) Testing is an expensive and laborious phase of the software process. Explain about the testing workbenches. (10 marks)

Department of Advanced Science and Technology

University of Computer Studies

B.C.Sc (Hons:)

CS -406 (Artificial Intelligence)

First Term Examination

March 2013

Answer All questions.

Time allowed : 3 hours.

1. Define the following.
 - (a) Model Checking
 - (b) Conjunctive Normal Form
 - (c) Causal Rules
 - (d) Unification
 - (e) Unit Propagation
2. (a) Consider a knowledge base containing just two sentences: $P(a)$ and $P(b)$. Does this knowledge base entail $\forall x P(x)$? Explain your answer in terms of models. Is the sentence $\forall x, y x = y$ valid? Explain.
(b) Determine whether the following sentence is valid, satisfiable or unsatisfiable by using a truth table.
$$((P \Rightarrow (Q \vee R)) \wedge \neg(Q \vee R)) \Rightarrow \neg P$$
3. (a) Suppose a knowledge base contains just one sentence, $\exists x \text{AsHighAs}(x, \text{Everest})$. Which of the following are legitimate results of applying Existential Instantiation?
 - (i) $\text{AsHighAs}(\text{Everest}, \text{Everest})$
 - (ii) $\text{AsHighAs}(\text{Kilimanjaro}, \text{Everest})$
 - (iii) $\text{AsHighAs}(\text{Kilimanjaro}, \text{Everest}) \wedge \text{AsHighAs}(\text{BenNevis}, \text{Everest})$
4. (a) Consider a knowledge base that contains the following propositional logic sentences:
$$Q \Rightarrow P$$
$$P \Rightarrow \neg Q$$
$$Q \vee R$$

Construct a truth table that shows the truth value of each sentence in KB and indicate the models in which the KB is true.

- (i) Does $\text{KB} \models R$?
 - (ii) Does $\text{KB} \models (R \Rightarrow P)$.
 - (iii) Does $\text{KB} \models (Q \Rightarrow R)$?
- (b) Represent the following sentences in First-Order-Logic.
 - (i) Everyone has someone who loves them.
 - (ii) Mary owns a dog.

X⁶

- (iii) All numbers are bigger than themselves divided by two.
- (iv) A grandparent is a parent of one's parent.
- (v) Adding 0 to any natural number m gives m itself.

- (c) Someone says: "One either Saturday or Sunday, if I am free, I will go to the concert". Using propositional logic, the statement is represented as:

$$(\text{Saturday} \wedge \text{Sunday}) \Rightarrow (\text{Free} \Rightarrow \text{concert})$$

Convert the above sentence into conjunctive normal form.

5. (a) Consider a knowledge base contains the following sentence.

All cats like fish.

Cats eat everything they like.

Ziggy is a cat.

Does Ziggy eat fish?

Show the result by using forward chaining.

- (b) Given the following, can you prove that West is a criminal? Derive your answer using resolution proof?

The law says that it is a crime for an American to sell weapons to hostile nations.

The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American.

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Department of Advanced Science and Technology

University of Computer Studies

B.C.Tech. (Hons:)

CT -401 (Artificial Intelligence)

First Term Examination

March 2013

Answer All questions.

Time allowed : 3 hours.

1. Define the following.
 - (a) Truth Table
 - (b) Logical Equivalence
 - (c) Factoring
 - (d) Completeness
 - (e) Arity
2. (a) Consider a knowledge base containing just two sentences: $P(a)$ and $P(b)$. Does this knowledge base entail $\forall x P(x)$? Explain your answer in terms of models. Is the sentence $\forall x, y x = y$ valid? Explain.
(b) Define Diagnostic rules with example.
(c) Consider a vocabulary with only four propositions, A, B, C, and D. How many models are there for the following sentences?
$$A \Leftrightarrow B \Leftrightarrow C$$

(d) Determine whether the following sentence is valid, satisfiable or unsatisfiable by using a truth table.
3. **Big \vee Dumb \vee (Big \Rightarrow Dumb)**
 - (a) Compare the inference-based agent and the circuit-based agent.
 - (b) What are the three possible sources of complexity for the Forward Chaining algorithm? Discuss in detail.
4. (a) Represent the following sentences in First-Order-Logic.
 - (i) One plus two equals three.
 - (ii) Whoever can read is literate.
 - (iii) Some flowers are pink.
 - (iv) No purple mushroom is poisonous.
 - (v) Some of the sons of Peter's best friend have children.
(b) Show how Backward Chaining work for the following knowledge base with AND-OR graph.

$$P \Rightarrow Q$$

$$L \wedge M \Rightarrow P$$

$$B \wedge L \Rightarrow M$$

$$A \wedge P \Rightarrow L$$

$$A \wedge B \Rightarrow L$$

$$A$$

$$B$$

(c) Sam, Clyde, and Oscar are rabbits. We know the following facts about them:

1. Sam is pink.
2. Clyde is gray and likes Oscar.
3. Oscar is either pink or gray (but not both) and likes Sam.

Use resolution refutation to prove that a gray rabbit likes a pink rabbit; that is, prove

$$(\exists x, y)[\text{Gray}(x) \wedge \text{Pink}(y) \wedge \text{Likes}(x, y)].$$

5. (a) Given the following, can you prove that West is a criminal? Derive your answer using resolution proof?

The law says that it is a crime for an American to sell weapons to hostile nations.

The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American.

- (b) Suppose the agent has progressed to the point shown in the following figure, having perceived nothing in [1,1] and a breeze in [2,1], and is now concerned with the contents of [1,2], [2,2] and [3,1]. Each of these can contain a pit. Construct the set of possible worlds. Mark the worlds in which the KB is true and those in which each of the following sentences is true:

α_1 =There is no pit in [1,2].

α_2 =There is no pit in [2,2].

?	?		
[1,2]	[2,2]		
[1,1]	Breeze	?	
[2,1]		[3,1]	

Show that $\text{KB} \models \alpha_1$ and $\text{KB} \models \alpha_2$.

Department of Advanced Science and Technology
University of Computer Studies
B.C.Tech. (Honours)
Mid-Term Examination
Electronics II (CT 403)
March, 2013



Answer all questions.

Time allowed: 3 hours

1. (a) For the circuit shown in figure 1(a-1), determine V_{DS} and V_{GS} . Graphically determine the Q-point for the p-channel JFET circuit using the transfer characteristic curve shown in figure 1(a-2).
- (b) The data sheet for an E-MOSFET reveals that $I_{D(on)} = 10\text{mA}$ at $V_{GS} = -12\text{V}$ and $V_{GS(th)} = -3\text{V}$. Find the drain current when $V_{GS} = -6\text{V}$.
- (c) Determine V_{GS} and V_{DS} for the E-MOSFET circuit in figure 1(c). Assume this parameter MOSFET has minimum values of $I_{D(on)} = 200\text{ mA}$ at $V_{GS} = 4\text{ V}$ and $V_{GS(th)} = 2\text{V}$.

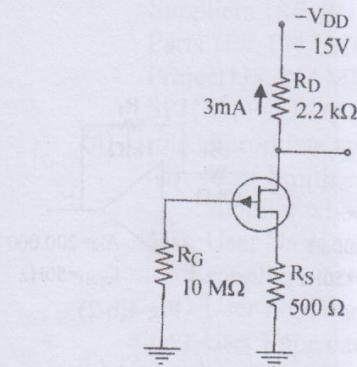


Fig-1(a-1)

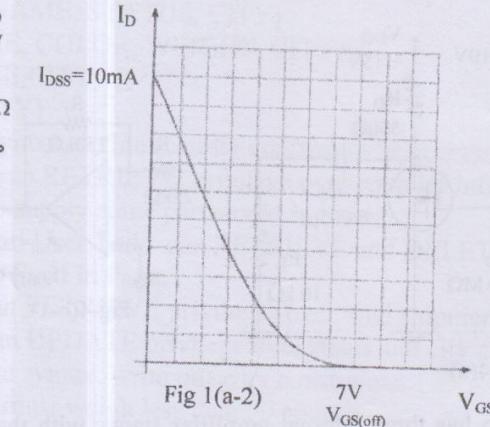


Fig 1(a-2) 7V $V_{GS(off)}$

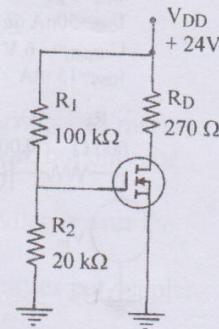


Fig-1(c)

2. (a) Given that $I_D = 2.8\text{ mA}$ in figure 2(a), find V_{DS} and V_{GS} . Assume that $V_{GS(off)} = -7\text{ V}$, and $I_{DSS} = 8\text{ mA}$. If a 50mV rms input signal is applied to the amplifier in figure 2(a), what is the peak-to-peak output voltage? Draw the output voltage waveform.
- (b) Determine the minimum and maximum voltage gain of amplifier in figure 2(b). What is the input resistance of this amplifier for each voltage gain? $g_m = 2000\mu\text{S} \sim 4000\mu\text{S}$

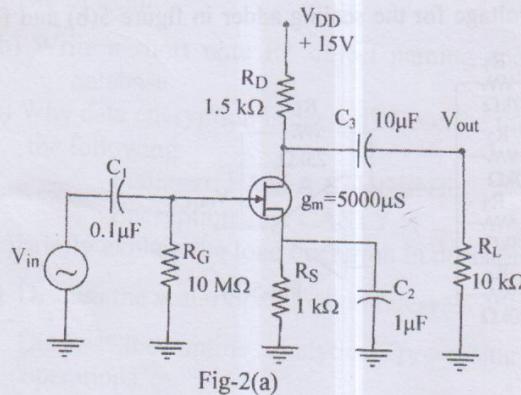


Fig-2(a)

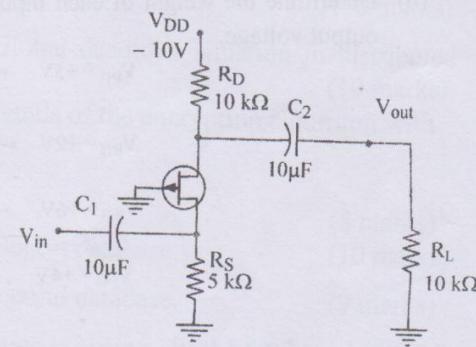


Fig-2(b)

3. (a) Determine the Miller input and output capacitances for the amplifier in figure 3.
 (b) Determine the high-frequency equivalent circuit for the amplifier in figure 3.

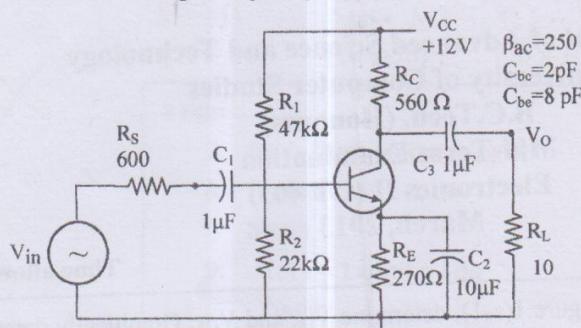


Fig-3

4. (a) Determine the critical frequencies associated with the **low-frequency response** of the FET amplifier in figure 4(a). What is the **phase shift** introduced by this circuit at the critical frequency?
 (b) Which of the amplifiers in figure 4(b) has the smaller bandwidth?

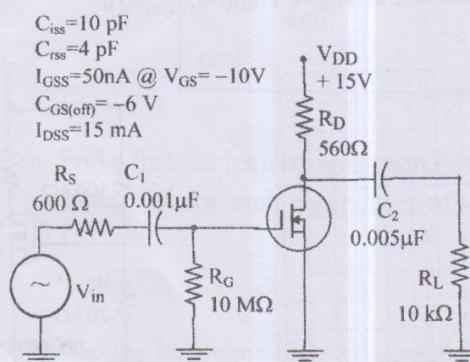


Fig-4(a)

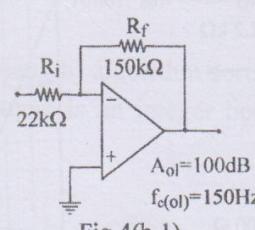


Fig-4(b-1)

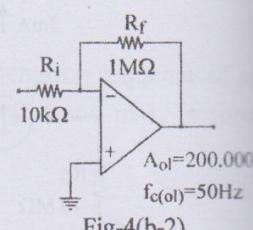
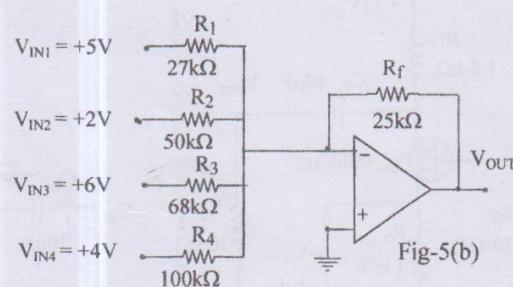


Fig-4(b-2)

5. (a) A certain op-amp has three internal amplifier stages with the following gains and critical frequencies:
 Stage 1: $A_{V1} = 40dB$ $f_{C1} = 10kHz$
 Stage 2: $A_{V2} = 30dB$ $f_{C2} = 50kHz$
 Stage 3: $A_{V3} = 20dB$ $f_{C3} = 150kHz$

Determine the open-loop midrange gain in decibels and the total phase lag when $f = f_{C1}$. Sketch the individual gain response for each stage and the composite gain response.

- (b) Determine the weight of each input voltage for the scaling adder in figure 5(b) and find the output voltage.



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Department of Advanced Science & Technology
University of Computer Studies
B. C. Tech. (Honours)
Mid Term Examination
Computer Architecture (CT 404)
April 2013

Answer all questions.

Time allowed: 3 hours

-
1. (a) Define two auxiliary signals that are used to express carries in carry lookahead adder. Based on the group of these two signals, design a 16-bit adder composed of 4-bit adders linked by carry lookahead.
(10 marks)
 - (b) Based on a 2-bit MODE control input, design the n -bit twos-complement adder-subtractor so that it can compute any of the three operations $X + Y$, $X - Y$ or $Y - X$.
(6 marks)
 2. (a) Demonstrate how Booth multiplication algorithm performs for multiplying 2 twos complement fractions where multiplier = 11010101 and multiplicand = 10110011.
(12 marks)
 - (b) Show how the datapath of a sequential n -bit binary divider is constructed.
(4 marks)
 3. (a) Illustrating the basic structure of combinational ALU and sequential ALU, discuss the strength and weakness of each design.
(10 marks)
 - (b) Describe how the ALU can easily be designed for expansion to handle operands of size $n = km$.
(6 marks)
 4. (a) The floating-point add unit of the IBM system/360 Model 91 composed of three steps: exponent comparison and mantissa alignment, mantissa addition and subtraction and result normalization. Based on this non-pipelined structure, redesign a register-level design of a floating-point adder pipeline with four stages. Explain how fixed-point addition can be also performed by this pipelined version of the floating-point adder.
(10 marks)
 - (b) Design a register file that stores eight 32-bit numbers and has one read port A and one write port B .
(6 marks)
 5. To compute the greatest common divisor of two numbers, the HDL description of gcd procedure is given in Figure 1. Assume that a start state S_0 is entered when it is reset; this state also loads X and Y into registers. The states S_1 and S_2 are defined for a swap and a subtraction, respectively. A final state S_3 is entered when $gcd(X, Y)$ has been computed. How would be the state assignment for this four-state machine in classical and one-hot methods? Again, obtain the entire set of next-state and output equations by these hardwired control methods.
(18 marks)

```

gcd (in:X,Y; out:Z);
  register XR, YR, TEMPR;
  XR:=X;
  YR:=Y;
  while XR>0 do begin
    if XR≤YR then begin
      TEMPR:=YR;
      YR:=XR;
      XR:=TEMPR; end
    XR:=XR-YR;
  end
  Z:=YR;
end gcd;

```

(Input the data)

(Swap XR and YR)

(Subtract YR from XR)

(Output the result)

Figure 1. HDL Description of gcd procedure

6. From the HDL description an 8-bit twos-complement multiplier, state assignments and control signals activated are given as in Figure 2. If three primary input signals of the control unit of this multiplier are BEGIN, Q[0] and COUNT7, construct an all-NAND one-hot design for this CU. (18 marks)

Label	State	Operations	Control signals activated
BEGIN:	S ₁	A:=0,COUNT:=0,F:=0,M:=INBUS;	c ₉ , c ₁₀
INPUT:	S ₂	Q:=INBUS;	c ₈
TEST1:		if Q[0]=0 then go to RSHIFT;	
ADD:	S ₃	A[7:0]:=A[7:0]+M[7:0],F:=(M[7] and Q[0]) or F;	c ₂ , c ₃ , c ₄
RSHIFT:	S ₄	A[7]:=F,A[6:0]:=A.Q[7:1],COUNT=COUNT+1 if COUNT7=0 then go to TEST1;	c ₀ , c ₁ , c ₁₁
TEST2:		if Q[0]=0 then go to OUTPUT1;	
SUBTRACT:	S ₅	A[7:0]:=A[7:0]-M[7:0],Q[0]:=0;	c ₂ , c ₃ , c ₄ , c ₅
OUTPUT1:	S ₆	OUTBUS:=A;	c ₆
OUTPUT2:	S ₇	OUTBUS:=Q;	c ₇
END:	S ₀	Halt;	END

Figure 2. State assignments and control signals activated for 8-bit twos-complement multiplier

Department of Advanced Science and Technology
University of Computer Studies
B.C.Tech. (Honours)
Mid-Term Examination
Linear Control System II (CT-405)
March, 2013

Answer all questions.

Time allowed: 3 hours

1(a) Consider a unity feedback system with $G(s) = \frac{(s+20)}{(s^2 + 4s + 20)}$.

- (i) Find the angle of departure of the root locus from the complex poles,
- (ii) Find the entry point for the root locus as it enters the real axis.
- (iii) Sketch the root locus.

(b) Consider a unity feedback system with $G(s) = \frac{k(s+2)}{s(s+1)(s+19)}$

Sketch the root locus of the system as K increases.

2. A unity feedback system has the process

$$G(s) = \frac{K(s+10)}{s(s+5)}$$

- (i) Determine the breakaway and entry points of the root locus and sketch the root locus for $K > 0$.
- (ii) Determine the gain K when the two characteristic roots have a ζ of $\frac{1}{\sqrt{2}}$.
- (iii) Calculate the roots.

3. A system has the loop transfer function

$$G(s) = \frac{5(1 + s/10)}{s(1 + 5s)(1 + s/9 + s^2/81)}$$

Determine the corner frequencies for the Bode plot. Sketch the asymptotic logarithmic magnitude versus phase angle curves for this robot arm system. Find the gain and phase margins of this system.

4. A unity feedback control system has a plant

$$G(s) = \frac{K}{s(s+2)(s+50)}$$

For $K=1300$, find the gain cross-over and phase cross-over frequencies, the gain margin and phase margin using exact method.

5. The single-loop feedback control system is shown in Figure 5. Determine the damping ratio, T_S , GM and PM for the uncompensated system. The lead compensation network is added to get the following specifications:

- (i) Settling time ≤ 4 sec
- (ii) System damping constant ≥ 0.4 .

Find the total compensated loop transfer function from Bode. Determine the GM and PM after compensating. Estimate the step response of the system by obtaining the settling time and damping ratio.

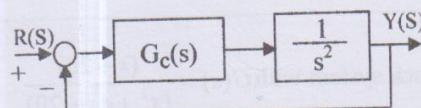


Figure 5

- 6 (a) The feedback control system has an open-loop transfer function: $GH(s) = \frac{K}{s(s+2)}$. It is specified that the velocity constant of this system be equal to 20, while the damping ratio of the dominant roots is equal to 0.45 and settling time be at least 1 sec. Design a phase-lag compensator using Root Locus.
- (b) Consider the PD controller system shown in Figure 6(b). Find the closed-loop transfer function and the sensitivity with respect to changes in $G(s)$.

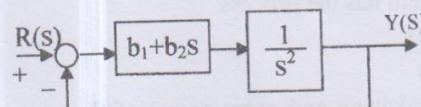


Figure 6(b)

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Department of Advanced Science and Technology
University of Computer Studies
B.C.Tech. (Honours)
Mid-Term Examination
Computer Networking (CT-406)
March, 2013

Answer All Questions.

Time allowed: 3 hours

1. Define the following terms:

- | | |
|--------------------------|---------------------------|
| (a) Virtual Lane | (f) Gigabit Ethernet |
| (b) Anycast | (g) Source Quench Message |
| (c) Mobile IP | (h) AS |
| (d) Inelastic Traffic | (i) WFQ Queuing |
| (e) Link Layer Switching | (j) ARP |

(each 2-marks)

2. Answer ANY SIX of the followings:

- (a) The three persistence protocols that can be used with CSMA
- (b) The pros and cons of limiting reassembly to the endpoint as compared to allowing en route reassembly
- (c) OSPF Protocol
- (d) Five main functions of DS traffic conditioning
- (e) Multiprotocol Label Switching
- (f) Multilane Distribution
- (g) Echo Request and Reply
- (h) Requirements for multicasting
- (i) RSVP Goals and Characteristics
- (j) Multiple Access Protocols

(each 4-marks)

3. (a) Write CSMA/CD rules and operating of CSMA/CD explanation with figure.

(b) Define flow label. What is the difference between the traffic class and flow label fields in the IPv6 header.

4. (a) What operations are performed by IGMP? Discuss about the IGMP message format?

(b) Explain the differences between Switches and Routers.

5. (a) Describe the original requirements for the design of Point-to-Point Protocol (PPP).

(b) Define subnetting. Given a network address of 128.168.0.0 and a subnet mask of 255.255.248.0, how many subnets are created and how many hosts are there per subnet?

6. Compare the three main approaches to routing. Give a brief description of the three main functions of Border Gateway Protocol.

(OR)

What is the Integrated Service Architecture? List and briefly describe the three categories of service offered by ISA.

(each 14-marks)
