

Department of Computer Science & Engineering

Begum Rokeya University, Rangpur

2nd Year 1st Semester Final Examination – 2010 (Session: 2008-09)

Course Code: CSE 2101

Course Title: Digital Logic Design

Total Time: 03:00 hrs

Total Credit: 3.0 Total Marks: 50

999

F

A

(Answer any Five. Figures in the margin indicate full marks.)

1. (a) Explain why the real world being mainly analog is a major problem of digital techniques. 2
- (b) Describe the usefulness of *Gray code*. Convert the *Gray code* 1101110 to *Octal*. 2+2=4
- (c) Mention the limitations of the *Parity* method for error detection. Attach an odd-parity bit to each of the following *HEX* numbers. 2+2=4
 - i) AFC₁₆
 - ii) B81₁₆
2. (a) What do you mean by *Sum-of-products* and *Product-of-sums* forms for logic expression? Give one example of each. 1+1=2
- (b) Suppose you are a project member of a team designing an unmanned supercar. Among many of the features for the car to be equipped with, one is to let the car automatically stop its engine if it is sitting idle for more than 5 minutes or if the engine temperature accidentally exceeds 250°C. The car has a sensor A that produces a HIGH (1) output when it senses the rear wheels moving; otherwise, LOW (0). Another sensor B reads the engine temperature and produces a HIGH (1) output if the temperature exceeds 200°C; LOW (0), otherwise. A small logic circuit in the car whose output is X produces a HIGH (1) output if the engine is running for more than 5 minutes, otherwise produces LOW (0). Showing all the steps design a logic circuit using the sensor outputs that can automatically stop the engine when the above mentioned conditions are met. 5
- (c) Simplify the following *K-map* using minimum number of loops. Here 'x' denotes "don't care" conditions. 3

		CD	CD	CD	CD	
		AB	1	1	0	x
		AB	0	0	0	0
		AB	0	0	0	0
		AB	1	x	0	1

3. (a) Differentiate between *Combinational devices* and *Sequential Devices*. 2
- (b) Define *Setup time* and *Hold time*. Suppose a certain FF has a propagation delay t_{PHL} of 5ns and t_{PLH} of 10ns. Can you apply a 100MHz clock to trigger the FF? Justify. 2+2=4
- (c) Draw the internal circuitry of the edge triggered J-K FF and describe its operation in brief. 4

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- ✓ 4. (a) What do you mean by MOD number of a counter? What will be the output frequency of a MOD-13 Parallel up counter triggered by a 1.3 MHz clock? 1+1=2

- (b) Describe how the *Strobing* method can be used to remove decoding glitches. 5

- (c) If each FF has a propagation delay of 50ns then what will be the maximum frequency of the clocks that can be applied to a MOD-16 Ripple counter and MOD-16 Parallel counter respectively? (Assume that a 4-input AND gate has a propagation delay of 2ns) 3

5. (a) What is a flip-flop? What is the difference between a latch and a flip-flop? List out the applications of flip-flop. 4

- (b) Describe all the steps involved in the design of a synchronous counter that repeats the sequence 000, 010, 100, 101, 111. All the undesired states (unused sequences) must go to the 000 state on the NEXT clock pulse 6

6. (a) What is a *Shift Register*? Can a *Shift Register* be used as a counter? If yes, explain how? 1+1+2=4

- (b) What is a decoder? Draw the logic circuit of a 3 line to 8 line decoder and explain its working. 1+5=6

7. (a) What is a demultiplexer? Discuss the differences between a demultiplexer and a decoder. 1+2=3

- (b) What is an encoder? Draw the logic circuit of Decimal to BCD encoder and explain its working principle. 1+6=7

Q3	Q2	Q1	Q0	AB
0	0	0	1	BA
0	0	1	0	AB
0	1	0	0	BA
1	0	0	1	BA

Department of Computer Science & Engineering

Begum Rokeya University, Rangpur

2nd Year 1st Semester Final Examination – 2010 (Session: 2008-09)

Course Code: CSE 1207

Course Title: Basic Statistics & Probability

Total Time: 03:00 hrs

Total Credit: 3.0 Total Marks: 50

F ✓
A

(Answer any Five. Figures in the margin indicate full marks.)

1. (a) Consider the experiment of tossing a coin 6 times. How many outcomes are $10 \times 1 = 10$ possible?

i) 4 ii) 16 iii) 32 iv) 64

- (b) If 2 objects are selected from 5 objects where the order is important, then the total number of experiment outcome is –

i) 10 ii) 30 iii) 20 iv) 40

- (c) If the experiment is repeated a large number of times, what method of assigning probability is used?

i) Relative frequency method ii) Subjective method
iii) Classical method iv) No particular method

- (d) In throwing a die one time, what is the probability that that two dots will occur?

i) 1 ii) $\frac{1}{2}$ iii) $\frac{1}{2}$ iv) $\frac{1}{6}$

- (e) The probability of any event is equal to the _____ of the probabilities of the sample points in the event –

i) Subtraction ii) Sum
iii) Multiplication iv) Deviation

- (f) $A \cup B$ means, A and B are the event containing all the sample points belonging to –

i) A and B ii) A or B
iii) A or B or both iv) A and B or both

- (g) What is the addition law for mutually exclusive events?

i) $p(A \cup B) = p(A) + p(B) - p(A \cap B)$ ii) $p(A \cup B) = p(A) + p(B) + p(A \cap B)$
iii) $p(A \cup B) = p(A) + p(B)$ iv) $p(A \cap B) = p(A) + p(B) + p(A \cup B)$

- (h) According to the census Bureau, deaths in the United States occur at a rate of 2425000 per year. The national center for health statistics reported that the three leading causes of death during 1997 were heart disease (725790), cancer (537390) and stroke (159877). Are the events heart disease and cancer mutually exclusive?

i) Yes ii) No

- (i) Let us suppose that $p(A) = 0.50$, $p(B) = 0.60$, $p(B) = 0.40$

i) They are mutually exclusive ii) They are independent
iii) They are not independent iv) No one is correct

- (j) For independent events –

i) $p(A|B) = \frac{p(AB)}{p(B)}$ ii) $p(A|B) = \frac{p(AB)}{p(A)}$
iii) $p(A|B) = p(A)$ iv) $p(A|B) = p(B)$

2. (a) Define Statistics. Distinguish between descriptive statistics and inferential statistics. Define population and sample with examples.

2

- (b) What are the various scales of measurements? Discuss them with appropriate examples.

2

(c) Define a frequency distribution. Distinguish between histogram and bar diagram.

(d) The following is a frequency distribution of the final examination scores of 200 students obtained in a three-week course in Statistics.

Scores	Number of Students
0-19	24
20-39	55
40-59	76
60-79	32
80-99	13
Total	200

Draw a histogram, a frequency polygon and an ogive. Calculate the mean, median, mode and the standard deviation.

3. (a) What is a weighted average? When is it appropriate to use a weighted average rather than a simple average? When they become identical?

(b) Six samples of sizes 150, 155, 140, 148, 135 and 160 were taken from the students of Begum Rokeya University, Rangpur, giving the mean heights 131.06, 143.26, 152.40, 155.45, 134.11 and 146.30 cm respectively. Estimate the mean height of the students.

(c) What is coefficient of variation? What are its advantages over the other measures of dispersion?

(d) Let us suppose that we have the following data:

	Height (inch)	Weight (Kg)
Mean	40	10
Standard Deviation	05	02

Which set of data has the more variability? Justify your answer.

(e) The sales of a department store had increased from taka 2 lacs in 1990 to taka 4 lacs in 1991 and taka 6 lacs in 1992. What is the average rate of increase in sales per year?

4. (a) Define probability with examples. What are the different methods of assigning probabilities? State the Baye's theorem.

(b) A city has a professional basketball team playing at home and a professional hockey team playing away on the same night. A professional basketball team has a 0.641 probability of winning a home game and a professional hockey team has 0.462 probability of winning an away game. Historically, when both teams play on the same night, the chance that the next morning's leading sports story will be about the basketball game is 60% and the chance that it will be about the hockey game is 40%. Suppose that on the morning after these games the newspaper's leading sports story begins with the headline "we win!!". What is the probability that the story is about the basketball team?

3

- (c) A purchasing agent has placed rush orders for a particular raw material with two different suppliers A and B . If neither order arrives in 4 days, the production process must be shut down until at least one of the orders arrives. The probability that supplier A can deliver the material in 4 days is 0.55 and the probability that supplier B can deliver the material in 4 days is 0.35. What is the probability that both suppliers will deliver the material in 4 days? What is the probability that at least one supplier will deliver the material in 4 days because of shortage of raw materials?

F ✓

5. Suppose that a random sample of size 20 is drawn on income (X) and expenditure (Y) from 20 families. The computer outputs are given as follows:

	Df	SS	MS	F	Significance F
Regression					3.83745E-11
Residual		400063.7685			
Total		4786774.95			

	Coefficients	Standard Error	t Stat	P-value
Intercept	1743.8761	311.5060382		2.59E-05
X Variable 1	0.396746092	0.028240442		3.84E-11

- (a) What is regression analysis? What is the regression model for this data? Write down the estimated model for this data.

2

- (b) Complete the above two tables by filling in the gaps.

2

- (c) Test the overall significance of the regression model. Test the individual parameters of the model, if necessary.

2

- (d) Interpret the coefficients of the model, where applicable. What is R^2 for this data? Interpret it.

2

- (e) What is \bar{R}^2 for this data? Interpret it. What is the justification of using \bar{R}^2 ?

2

6. (a) Write down the probability mass function of the binomial distribution. What are the properties of a binomial distribution? What are the basic differences between binomial and Poisson distribution?

4

- (b) Military radar and missile detection systems are designed to warn a country against enemy attacks. A reliability question is whether a detection system will be able to identify an attack and issue a warning. Assume that a particular detection system has a 0.90 probability of detecting a missile attack. If two detection systems are installed in the same area and operate independently, what is the probability that the systems will detect the attack? Would you recommend that multiple detection systems be used? Explain.

3

- (d) Phone calls arrive at the rate of 48 calls per hour at the reservation desk for Regional Airways. Find the probability of receiving exactly 10 calls in 15 minutes.

3

✓ Suppose no calls are currently on hold. If the agent takes 5 minutes to complete current call, what is the probability that none will be waiting?

7. (a) Small cars get better gas mileage but they are not as safe as bigger cars. Small cars accounted for 18% of the vehicles on the road, but accidents involving small cars led to 11,898 fatalities during a recent year. The probability of an accident involving a small car leading to a fatality is 0.128 and the probability of an accident not involving a small car is leading to fatality is 0.05. Suppose you learn of an accident involving a fatality. What is the probability a small car was involved?

3

- (b) A local bank is reviewing its credit card policy with a view to recalling some of its credit cards. In the past, approximately 5% of card holders have defaulted and the bank has been unable to collect the outstanding balance. Hence management has established a prior probability of 0.05 that any particular card holder will default. The bank has further found that the probability of missing one or more monthly payments is 0.20 for customers who do not default. Of course, the probability of missing one or more payments for those who default is 1.

2+2=4

- i) Given that a customer has missed a monthly payment, compute the posterior probability that the customer will default.
- ii) The bank would like to recall its cards if the probability that a customer will default is greater than 0.20. Should the bank recall its card, if the customer misses a monthly payment? Why or why not?

- (c) State lotteries have become popular means of fund raising. The *Power Ball* lottery is open to participants across several states. When entering the *Power Ball* lottery, a participant selects 5 numbers from the digits 1 through 9 and then selects a power ball number from the digits 1 through 42. One week in 1998 the *Power Ball* lottery jackpot reached \$150,000,000 in addition to a payoff of \$100,000 for anybody selecting the first five numbers correctly.

1+1+1=3

- i) Compute the number of ways the first 5 numbers can be selected.
- ii) What is the probability of winning the \$100,000 prize by selecting the first five numbers correctly?
- iii) What is the probability of winning the *Power Ball* jackpot?

Department of Computer Science & Engineering
2nd Year 1st Semester Examination – 2010 (Session 2008-09)
Course Code: CSE 2108 Course Title: Economics
Total Time: 03 hours Total Credit: 03 Total Marks: 50
(Answer any five)

1. a) Suppose the demand and supply curves for Cornflakes commodity in the UK are given by the following equations:

$$Q_d = 50 - 10P \quad Q_s = 5 + 20P$$

where Q_d = quantity demanded per year (million of boxes)

Q_s = quantity supplied per year (million of boxes)

Fill the table:

2

Price Per Box	Q_d	Q_s
\$ 0.50	-	-
\$ 1.0	-	-
\$ 1.5	-	-
\$ 2.0	-	-
\$ 2.5	-	-

- b) Graph the demand and supply curves and identify the equilibrium P^* and Q^* . 2
- c) What would happen the equilibrium P^* and Q^* if demand for Cornflakes double at each price? 3
- d) Suppose technological innovation reduce the Cornflakes production cost Draw a diagram that illustrates the likely effect on the market for Cornflakes and indicates the impact on equilibrium P and Q 3
2. a) Define price elasticity of demand and income elasticity of demand. 2
- b) What are the relationship between elasticity and total revenue. 3
- c) A sporting good store has estimated the demand curve for a shoes as a function of price. Use the following table to answer the questions below it. 5

Point	Price Per Pair	Shoe Sales Per Week
F	10	600
E	20	500
D	30	400
C	40	300
A	50	200
B	60	100
	70	0

- i) Draw the Demand curve and calculate demand elasticity using mid point formula between A & B, C and D and between E and F. 3
- ii) If the store currently charges a price of \$ 50, then increases this price to \$ 60 what happens to total revenue from shoe sales. 2
3. a) Define Total Cost, Average Cost and Marginal Cost. 3
- b) A firm can use three different production technologies, with capital (K) 2

And labour (L) requirements at each level of outputs as follows:

+2

+3

Daily Output	Technology 1		Technology 2		Technology 3	
	K	L	K	L	K	L
100	3	7	4	5	5	4
150	3	10	4	7	5	5
200	4	11	5	8	6	6
250	5	13	6	10	7	8

i) Suppose that firm is operating in a high-wage country, where capital cost is Tk. 100 per unit per day and labour cost is Tk. 80 per worker per day. For each level of output, which technology is the cheapest?

ii) Now suppose the firm is operating in a low-wage country, where capital cost is Tk. 100 per unit per day. For each level of output; which technology is the cheapest?

iii) Suppose the firm moves from a high-wage to a low-wage country but that its level of output remains constant at 200 units per day. How will its total employment change?

4. a) Define ISOquand and ISOcost. 2
 b) Find the least-cost- combination of Capital (K) and Labor (L) to produce 50 Unit of output of a firm where per unit Capital Cost $P_K = \$1$ and Labor Cost $P_L = \$1$ and Total Cost of Production respectively $TC = \$5$; $TC = \$6$ and $TC = \$7$. 2
 c) A Firm's cost curves are given by the following table: 6

Q	TC	TFC
0	\$ 100	\$ 100
1	\$ 130	\$ 100
2	\$ 150	\$ 100
3	\$ 160	\$ 100
4	\$ 172	\$ 100
5	\$ 185	\$ 100
6	\$ 210	\$ 100
7	\$ 240	\$ 100
8	\$ 280	\$ 100
9	\$ 330	\$ 100
10	\$ 390	\$ 100

- i) Find TVC, AVC, ATC, and MC
 ii) Graph AVC, ATC, and MC on the same graph. What is the relationship between MC and AVC?
 iii) Suppose that market price is \$ 30, How much will the firm produce in the short run? How much are total profits?

5. a) What are the major objectives of macro economics? Write a brief

4

- definition of each of these objectives.
- b) What are the instruments or tools that governments can use to pursue their economic goals?
- c) Macro Economic data for the Bangladesh as follows:

Year	Nominal GDP (\$ billion)	Real GDP (\$ billion)	CPI 1983 = 100
1980	2789.5	5161.7	82.4
1981	3128.4	5291.7	90.9
1982	3255.5	5189.3	96.5
1983	3536.7	5423.8	99.6
2001	10100.8	9866.6	177.1
2002	10480.8	10083.0	179.9

- i) Calculate the inflation rate in 1981 and 2002.
- ii) Calculate the GDP price index (P) in 1982 and 2002.
6. a) What are the components of aggregate demand (AD) and why the AD curve down-ward sloping? 3
- b) What are the major factors determining Aggregate Supply macro economic equilibrium value of price (P_L) and aggregate output (Q) are determined? 4
- c) If the AD rise due to increase the government expenditure; how does the economy reach its equilibrium? Graphically find the P and Q that satisfy the buyers and sellers all taken together. 3
7. a) Distinguish between GDP and GNP. 2
- b) How can we calculate disposable personal income (DI) from the Gross Domestic Product (GDP). 2
- c) What do means by "Price Indexes" and "Rate of Inflation"? 2
- d) What would be the effect of each of the following on AD (aggregate demand) or on AS (aggregate supply) as indicated (other things remain constant)
- i) A large cut in personal and business taxes (T). 4
- ii) An increase in potential output. 2

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2nd Year 1st Semester Final Examination – 2010 (Session: 2008-09)

Course Code: CSE 2105

Course Title: Data Structures

Total Time: 03:00 hrs

Total Credit: 3.0

Total Marks: 50

(Answer any Five. Figures in the margin indicate full marks.)

1. (a) What do you mean by data structures? Describe the usefulness of data structures. 1+2+1=4
Mention some examples of data structures.

- (b) What do you mean by complexity of an algorithm? What are meant by *best case*, *worst case* and *average case* complexity? 1+2=3

- (c) Find out the *best case* & *worst case* complexity for the following algorithm. Here, n is the size of the input data, b is a positive integer and x is a variable. 3

1. Set j:=b
2. Repeat step 3 While j<= n
3. If j=x then:
 PRINT: Found and Exit
Else:
 Set: J = J X J
4. Exit

2. (a) What is array? Write a procedure (in pseudocode) to delete three consecutive elements indexed at k, k+1 and k+2 from a linear array A(0:n), where k<(n-2). 1+3=4

- (b) Discuss the advantages (if any) of a two-way list over a one-way list for each of the following operations – 3

- i.) Searching for a given element ITEM in a sorted list.
ii.) Deleting a node whose location is given.
iii.) Traversing the list to process each node.

- (c) What is header linked list? Explain its necessity. 1+2=3

3. (a) What are the differences between STACK and QUEUE? 2

- (b) When a recursive procedure is called *well-defined*? Is the following recursive procedure *well-defined*? Justify. 1+1+2=4

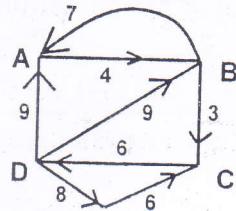
$$f(n) = \begin{cases} 0 & ; \text{when } n = 99 \text{ or } n = 100 \\ f(n+1) + f(n+2) & ; \text{otherwise} \end{cases}$$

Here, n is a negative integer.

- (c) Convert the following infix expression into postfix using a STACK. 4

L – (A + B ↑ (D + E/F) ↑ G) – K

4. (a) Define *simple graph* and *multi graph*. When a directed graph is called connected? 2
 (b) Using *Warshall's algorithm*, find out the shortest path from A to C in the following weighted directed graph.



- (c) i) Consider the following pseudocode:

```

declare a stack of characters
while ( there are more characters in the word to read )
{
  read a character
  push the character on the stack
}
while ( the stack is not empty )
{
  pop a character off the stack
  write the character to the screen
}
  
```

What is written to the screen for the input "carpets"?

- A. serc
- B. carpets
- C. steprac
- D. ccaarrppeeettss

- ii) In the linked list implementation of the stack class, where does the push method place the new entry on the linked list?

- A. At the head
- B. At the tail
- C. After all other entries that are greater than the new entry.
- D. After all other entries that are smaller than the new entry.

- iii) What is the value of the postfix expression $6\ 3\ 2\ 4\ +\ -\ *:$

- A. Something between -15 and -100
- B. Something between -5 and -15
- C. Something between 5 and -5
- D. Something between 5 and 15
- E. Something between 15 and 100

5. (a) Describe the Binary Search procedure? Devise the complexity of the Binary Search Algorithm. 4+3=7
 (b) Give a relative comparison between *linear search* and *Binary Search*? 3

6. (a) Discuss the complexity of the heap building algorithm.
- (b) Build a *min heap* from the following data. Then repeatedly delete the root to find a sorting of the data. Show all the intermediate steps during the deletion process.
50, 40, 33, 22, 55, 75, 30, 42, 100
- (c) Define *Simple Cycle*.

2

3

7

7. (a) What is recursive procedure? What are main properties for a recursive procedure
- (b) Write a recursive method with two int parameters, m and n. The precondition requires $0 \leq m$ and $m \leq n$. The method prints a line of m asterisks, then a line of $m+1$ asterisks, and so on up to a line of n asterisks. Then the same pattern is repeated backward: a line of n asterisks, then $n-1$, and so on down to n. The only loop allowed in your implementation is a loop to print a line of m asterisks. You may have two copies of this loop in different places of the implementation.