



# COLLEGE OF ENGINEERING & TECHNOLOGY

(A Constituent College of Biju Patnaik University of Technology, Odisha)

Registration No:

1 | 8 | 0 | 1 | 1 | 0 | 6 | 1 | 0 | 0

Time: 2 Hours		Max marks: 20	Btech
		Mid-Term Examination : 2019-20	
		SUBJECT: Engineering Economics & Costing	
		BRANCH: CIVIL, ELECTRICAL, IT, CSE, TEXTILE, Section- A & B	
		Answer Question No.1 any five and any Three from the rest.	
		The figures in the right hand margin indicate marks.	
Q1	Answer the following questions:		(1 x 10)
	a) Give the scarcity definition of economics?		
	b) What is Giffen goods?		
	c) When $MP=0$ , $TP=?$		
	d) What is income elasticity of demand?		
	e) What is variable factor?		
	f) What do you mean by time value of money?		
	g) Define mutually exclusive project?		
	h) Define effective rate of interest?		
	i) What is an annuity?		
	j) What do you mean by distribution?		
Q2	a) What do you mean by NPW?		(2.5)
	b) Evaluate the economic desirability of the following project based on present worth method of comparison. Year- 0 1 2 Net cash flow -40000 10000 15000 (i = 15%) (P/F, 15%, 1) = 0.8696 (P/F, 15%, 2) = 0.7561		(2.5)
Q3	a) Difference between Micro and Macro?		(2.5)
	b) Define law of demand?		(2.5)
Q4	a) What are the conditions for computing EAW?		(2.5)
	b) What do you mean by economic activities?		(2.5)
Q5	a) For the demand function $6x+4p=10$ , find elasticity of demand? When $x=4$		(2.5)
	b) Given market model, $Q_d=Q_s$ , find the equilibrium price & quantity $Q_d=18-2p$ $Q_s=6p-6$		(2.5)
Q6	Define measurement of price elasticity of demand by point method?		(5)
Q7	How can you compute RFW and CFW? What are the steps involved with it?		(5)

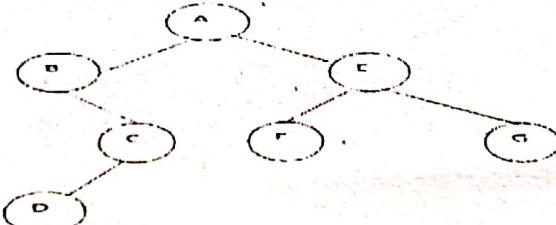


# COLLEGE OF ENGINEERING & TECHNOLOGY

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Registration No:

1 8 0 1 1 0 6 1 0 0

Total Number of Pages: 2		B.TECH
Time: 2 Hours	Max marks: 20	
Mid-Term Examination : 2019-20		
SUBJECT: Data Structure Using C		
BRANCH: INFORMATION TECHNOLOGY      Section-		
Answer Question No.1 which is compulsory and any Three from the rest.		
The figures in the right hand margin indicate marks.		
Q1	Answer the following questions:	(0.5 x 10)
	a) The following numbers are inserted in an empty binary search tree in the given order : 8, 1, 3, 5, 17, 12, 15. Construct the binary search tree.	
	b) What are the limitation of arrays in comparison to the linked list?	
	c) What are the sequence of values popped out when the following sequence of operations is performed on a stack: PUSH(10), PUSH(20), POP, PUSH(10), PUSH(20), POP, POP, PUSH(20), POP	
	d) What is a queue? What are limitations of linear queue?	
	e) Write down the applications of an element in a two dimensional array, if the element is stored in row-major order?	
	f) Evaluate the given postfix expression 10 2 8 * + 3 -	
	g) How to represent a binary tree using linked list?	
	i) What is the difference between height and depth of node in a tree?	
	j) What is a self referential structure? What are their use?	
Q2	a) How many pointers are manipulated while deleting a node at the beginning of a double circular linked list? Justify your answer with suitable code and diagram.	(2.5)
	b)	(2.5)
		
	Find out the in order, pre order, post order traversal of the given tree.	
Q3	a) Write down the algorithm for insertion operation in a circular queue.	(2.5)
	b) Construct a binary tree whose pre order and in order sequences are A B M H E O C P G J D K L I N F and H M C O E B A G P K L D I N J F respectively.	(2.5)
Q4	Write C segment to insert a node in between the nodes of a double linked list and delete a node from the end of circular linked list.	(5)
Q5	Write a complete a c program to create a stack using an array and perform the following operation (i) push (ii) pop (iii) traverse	(5)



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Registration No:

1 | 8 | 0 | 1 | 1 | 0 | 6 | 1 | 0 | 0

Total Number of Pages: 2

Time: 2 Hours

Max marks: 20

B.TECH  
UPCIT302

Mid-Term Examination : 2019-20

SUBJECT: Object Oriented Programming Using Java

BRANCH: INFORMATION TECHNOLOGY Section-

Answer Question No.1 which is compulsory and any Three from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions:

(0.5 x 10)

- a) Why Java is called architecturally neutral?
- b) Write an example that shows the use of 'super' keyword.
- c) Write the difference between String and StringBuffer class.
- d) Why do we use 'final' keyword.
- e) Differentiate between local variable and instance variable.
- f) What do you mean by automatic garbage collection?
- g) What will be the output of the following?

```
int a, b;  
a = 10;  
b = (a == 1) ? 20: 30;  
System.out.println( "Value of b is : " + b );
```

```
b = (a == 10) ? 20: 30;  
System.out.println( "Value of b is : " + b );
```

- h) "Interfaces are able to extend more than one Interface but a Class can't extend more than one Class". Why?
- i) Can we make an instance of an abstract class? Justify your answer with an example?
- j) Write down the advantages of package.

Q2 a) Write a note on Java Virtual Machine.

(2.5)  
(2.5)

b) Write a program that explains the concept of method overloading.

Q3 a) What is constructor. Write its characteristics.

(2.5)

b) Write a program that creates arithmetic exception.

(2.5)

Q4 Describe the features of object oriented language.

(5)

Q5 Describe about different types of inheritances used in Java with example.

(5)

**COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(A Constituent College of Biju Patnaik University of Technology, Odisha)**

Registration No:

1 8 0 1 1 0 6 1 0 0

Total Number of Pages: 02	B.Tech
Time: 2 Hours Max marks: 20	SEMESTER : 3rd
<b>Mid-Term Examination : 2019-20</b>	
<b>SUBJECT: MATH -III</b>	
<b>BRANCH: All Branches</b>	

**Answer Question No.1 which is compulsory and any Three from the rest.**

The figures in the right hand margin indicate marks.

Q1	Answer the following questions:	(0.5 x 10)
	a) If A and B are two independent events, then $A^c$ and B are also independent. (T/F)	
	b) What is the probability that a leap year has 53 Monday?	
	c) If $Y=a+bX$ , where X & Y are two random variables ,then $\rho_{xy}=1$ when $b>0$ and $\rho_{xy}=-1$ when $b<0$ . (T/F)	
	d) If X and Y are two random variables with $\sigma_x=2$ and $\sigma_y=3$ and covariance $\sigma_{xy}=-2$ , then find the variance of the random variable $3X-4Y+8$ .	
	e) Write the condition when two random variables are stastically independent .	
	f) Find the total number of trials occurs in a binomial experiment having mean 6 and standard deviation of 2.	
	g) Write down the conditions under which binomial distribution become poisson distribution.	
	h) If in a book there are 5 mistakes on an average ,then find the probability by opening a page of the book we will have atleast one mistake.	
	i) What are the values of mean and standard deviation of the standard normal random variable?	
	j) A random variable X has a mean $\mu=8$ and variance $\sigma^2 = 9$ , and an unknown probability distribution, then find $P(-4 < X < 20)$ .	
Q2	a) State and prove the Bayes' Rule.	(2.5)
	b) Find $E(g(X))$ , if the weekly demand of a drink , in thousand liters , at a chain of conveniences stores is a continuous random variable X with $g(X)=X^2 +X -2$ , and $f(x)=\begin{cases} 2(x-1), & 1 < x < 2 \\ 0, & \text{otherwise} \end{cases}$	(2.5)



# COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous & Constituent College of Biju Patnaik University of Technology, Odisha)

Registration no:

1801106100

Total Number of Pages: 1		B.TECH
Time: 2 Hour	Max marks: 20	
Mid-Term Examination : 2019-20		
SUBJECT: Digital Electronics		
BRANCH: IT		
Answer Question No.1 which is compulsory and any Three from the rest. The figures in the right hand margin indicate marks.		
Q1	Answer the following questions:	(0.5 x 10)
a)	What do you mean by nibble & byte?	
b)	Convert $(110110010)_2 = (\text{ })_G$ ?	
c)	Convert $(A08F.EA)_{16} = (\text{ })_{10}$ ?	
d)	Represent the given binary number in Sign Magnitude form and 2's Complement form $0110011$ ?	
e)	Convert $(BAF.AE)_{16} = (\text{ })_B$ ?	
f)	is a Reflective code and why?	
g)	In an even Parity Scheme which of the following words contains an error? A) 10101010      B) 101111011	
h)	$A+AB+ABC+ABCD+ABCDE+\dots = \text{ }$	
i)	The Transposition theorem states that	
j)	Implement EX-OR function using NAND only?	
Q2	a) Each of the following arithmetic operations is correct in at least one number system. Determine the possible bases in each operation? A) $\frac{41}{3} = 13$ B) $\sqrt{41} = 5$	(2.5)
	b) Perform the following Decimal addition and subtraction in BCD Code? A) $236.5 + 572.4$ B) $306.7 - 253.3$	(2.5)
Q3	a) Simplify the Boolean function $Y = A'C + A'B + BC + AB'C$	(2.5)
	b) Minimize the following function using k-map and Implement it using AOI Logic. $F(A,B,C,D) = \sum m(0,1,4,7,13,14) + \sum d(5,8,15)$	(2.5)
Q4	a) Design a 4-bit magnitude comparator.	(2.5)
	b) Design a 4-bit BCD to Gray code Converter with proper diagram.	(2.5)
Q5	a) Design a decimal to BCD Encoder?	(2.5)
	b) Design a 4-bit binary adder and subtractor circuit and explain its operation?	(2.5)

Roll No:

1801106100

Number of Pages: 02

59

B.TECH  
UPCIT301

3<sup>rd</sup> Semester Regular Examination 2019-20  
Object Oriented Programming using JAVA  
BRANCH: INFORMATION TECHNOLOGY

Time: 3 Hours

Max Marks: 70

Answer Part-A which is compulsory and any five from Part-B.  
The figures in the right hand margin indicate marks.

Q1

Part – A (Answer all the questions)

(2 x 10)

- a) What is the difference between Exception handler and Default handler?
- b) Define Modifiers? Mention its type with example?
- c) Which modifiers cannot be used with interface and Why?
- d) What is the difference between Byte stream and Character stream?
- e) Object is termed as instance of a class. True or false? Justify your answer?
  
- f) What is the output of the following program? Justify your answer?  
class test  
{public static void main(String args[]){  
int x=5,y=2;  
double z=x/y;  
System.out.println(z);  
}  
}  
  
g) Mention the different methods with example to extract int, float, double, Boolean value from String value?
- h) Why applet does not have menu bar, title bar or border?
- i) What is the difference between this and super keyboard?
  
- j) Why main method is static in java?

Part – B (Answer any five questions)

Q2

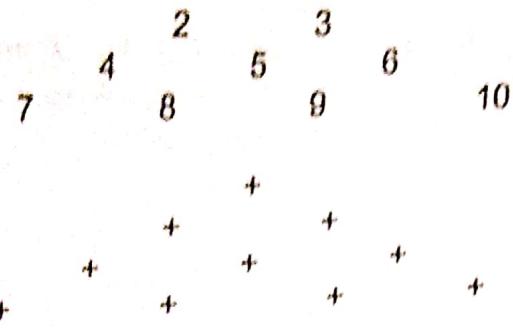
Define Synchronization? Why is it needed? Write a java program to explain the need of synchronization in multithreading with suitable example?

10

Q3

- a) What do you mean by command line arguments? (5)  
Write a java program to find the summation of all prime digits of a number except 1 and 3 using command line arguments ? Suppose no=23589 then output=2+5=7.
- b) Define Array? Write a java program to find difference between largest even no and smallest odd no in an array of 10 numbers? (5)

- Q4 a) Define method overloading? Can a method will be overloaded by simple simply changing its return type? Justify your answer? (5)  
Write a java program to print following using method overloading and interface?



(5)

- b) Define inheritance? Why is multiple inheritance not supported by java?  
 Write a java program to compute volume, cost and weight of a box using multilevel inheritance? use super keyword at appropriate places?

(5)

- Q5** a) Define Thread? Write a java program to compute following using multithreading and set priority in such a way that execution will start from last function  
 ➤ Greatest among three numbers  
 ➤ Factorial of any Number

(5)

- b) Define Applet? Write a program to display one bouncing ball which is dropped from some height represented by coordinate (50, 10) and after that it will bounce and finally stop at the position (500,450) using Applet? Here size of the window is 500 \* 500 and color of the ball is blue and background is yellow ?

(5)

- Q6** a) What is package? Write a program to findout sum of product of consecutive digits of a number using interface, package and commandline arguments?  
 Suppose Number is 12345 then Result will be  $1*2 + 2*3 + 3*4 + 4*5$   
 b) Define interface? Write a java program to enter 10 numbers in stack using push operation then remove 3 elements using pop operation and display rest? use interface and class ?

(5)

- Q7** a) Define swing? Write a java program to display one blinking text of your name using swing?  
 b) What do you mean by Exception handling? Write a java program to create your own exception which createPrimeException when it will detect any prime number entered by user?

(5)

(5)

- Q8** Short notes on any two  
 a) Encapsulation  
 b) Life cycle of Thread  
 c) AWT event hierarchy  
 d) JAVA FX  
 e) Tree Set

(5x2)



## COLLEGE OF ENGINEERING & TECHNOLOGY

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Registration No:

1 8 0 1 1 0 6 1 0 0

Total Number of Pages: 2

Time: 2 Hours

Max marks: 20

B.TECH

Mid-Term Examination : 2019-20

SUBJECT: Formal Language and Automata Theory (FLAT)

BRANCH: INFORMATION TECHNOLOGY Section-

Answer Question No.1 which is compulsory and any Three from the rest.  
The figures in the right hand margin indicate marks.

Q1	Answer the following questions:	(0.5 x 10)
a)	What is the difference between NFA and DFA	
b)	Define transition diagram and transition table.	
c)	Define Pumping Lemma.	
d)	Explain mealy and Moore machine?	
e)	What is the difference between positive closure and kleene closure?	
f)	What is the difference between CFG and CSG?	
g)	Define Ambiguity.	
h)	What the difference between left most derivation and right most derivation?	
i)	Discuss the Chomsky's Hierarchy of Grammars with examples	
j)	Define Arden's theorem.	
Q2	a) Design a NFA for the language L = all strings over {0, 1} that have at Least two consecutive 0's or 1's with example.	(2.5)
	b) Design DFA for the language L={w:n a = 1,w€(a,b)*}	(2.5)
Q3	a) Construct Finite automata for regular expression r = 01*(0+1)*	(2.5)
	b) Define CNF. Change the following grammar in to CNF. Consider a grammar G= ( $\{S, A, B\}$ , $\{a, b\}$ , P, S) where S is the start symbol and P is given by $S \rightarrow bA / aB , A \rightarrow bAA / aS / a , B \rightarrow aBB / bS / a$	(2.5)
Q4	Consider the grammar G: ( $S \rightarrow S^*S/S+S/(S)/S/a/b$ ).Derive the string $(a+a^*b)$ from the grammar and test wheather the grammar is ambiguous or not.	(5)
Q5	Construct a grammar in Greibach normal form (GNF) equivalent to the grammar $S \rightarrow AA/a , A \rightarrow SS/b$	(5)

Registration No: 1801106100

Total Number of Pages: 02  
Code : 187

B.TECH  
UHSMH211

**3<sup>rd</sup> Semester Regular Examination 2019-20**  
**ENGINEERING ECONOMICS**  
**BRANCH: COMMON**

**Time: 3 Hours**

**Max Marks: 70**

**Answer Part-A which is compulsory and any five from Part-B.**  
**The figures in the right hand margin indicate marks.**

**Part - A (Answer all the questions)**

**(2 x 10)**

**Q1** Answer the following questions:

- a) What are the conditions for computing NPW ?
- b) What do you mean by average contribution of margin?
- c) What do you mean by short-run production function ?
- d) Define effective rate of interest.
- e) Define mutually exclusive project.
- f) What is sinking fund method ?
- g) What do you mean by time value of money?
- h) What do you mean by decreasing Returns to scale?
- i) How can you compute future worth method?
- j) What is price elasticity of demand?

**Part - B (Answer any five questions)**

**(5)**

**Q2** a) Evaluate the economic desirability of the following project based on present worth method of comparison.

Year	Net cash flows (Rs.)
0	80,000
1	60,000
2	40,000
3	20,000
	I=15%

$$(P/F, 15\%, 1)=0.8696$$

$$(P/F, 15\%, 2)=0.7561$$

$$(P/F, 15\%, 3)=0.6575$$

$$(P/A, 15\%, 4)=2.2832$$

- b) Explain the law of supply with its limitation. (5)

Q3 a)

Particulars	A	B	(5)
Initial cost ( $R_1$ )	4,00,000	3,00,000	
Useful life (Years)	10	10	
Annual Receipt (R)	3,00,000	1,50,000	
Salvage value	1,00,000	20,000	

Find the best alternative using the Annual Equivalent method of comparison. Assume the interest rate of 15% compounded annually .

$$(P/A, 15\%, 10) = 5.0188$$

$$(P/F, 15\%, 10) = 0.2472$$

$$(A/P, 15\%, 10) = 0.1993$$

- b) Distinguish between private project and public project. (5)

- Q4 a) How the Equilibrium Price is determined under perfect competition? (5)

- b) Explain the functions of a Reserve Bank of India. (5)

- Q5 a) Distinguish between fixed cost & variable cost? (5)

- b) Explain the law of variable proportion with its diagram? (5)

- Q6 a) Explain the Time value of money. (5)

- b) Distinguish between micro and macro economics. (5)

- Q7 a) How the market equilibrium will be determined on the basis of demand and supply? Explain diagrammatically. (5)

- b) Explain the Algebraic method of Break even analysis . (5)

- Q8 a) Why is study of depreciation significant? why depreciation occurs? . (5)

- b) What do you mean by Annuity? (5)

Registration No:

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Total Number of Pages: 02  
Code : 169

B.TECH  
UBSMH301

3<sup>rd</sup> Semester Regular Examination 2019-20  
MATHEMATICS-III  
BRANCH: COMMON

Time: 3 Hours

Max Marks: 70

Answer Part-A which is compulsory and any five from Part-B.  
The figures in the right hand margin indicate marks.

Q1

Part – A (Answer all the questions)

- a) Answer the following questions: (2 x 10)
  - a) What is the probability of getting a total of 7 or 11 when a pair of fair dice is tossed?
  - b) Define the co-variance of random variables  $X$  and  $Y$ .
  - c) How conditional probability works on independent events.
  - d) Find the mean of the Poisson distribution.
  - e) How can you compare binomial and hyper-geometric distribution?
  - f) Define Weibull's distribution.
  - g) Write the characteristics of Normal Distribution curve?
  - h) What do you mean by tolerance limits?
  - i) What do you mean by Statistical quality control?
  - j) Define Type I Error, Type II Error.

Part – B (Answer any five questions)

- Q2 a) From 4 red, 5 green, and 6 yellow apples, how many selections of 9 apples are possible if 3 of each colour are to be selected? (5)
- b) Two ballpoint pens are selected at random from a box that contains 3 blue pens, 2 red pens, and 3 green pens. If  $X$  is the number of blue pens selected and  $Y$  is the number of red pens selected, then find the joint probability function  $f(x, y)$ . Also, find  $P[(X, Y) \in A]$ , where  $A$  is the region  $\{(x, y) | (x + y) \leq 1\}$ . (5)
- Q3 a) A random variable  $X$  has a mean  $\mu = 10$  and a variance  $\sigma^2 = 4$ . Using Chebyshev's theorem, find (i)  $P(|X - 10| \geq 3)$ , (ii)  $P(|X - 10| < 3)$  and (iii)  $P(5 < X < 15)$ . (5)
- b) State and prove Bayes' Theorem (5)
- Q4 a) Given a random sample of size 24 from a normal distribution, find 'k' such that (5)
  - (i)  $P(-2.069 < T < k) = 0.965$ ;
  - (ii)  $P(k < T < 2.807) = 0.095$ ;
  - (iii)  $P(-k < T < k) = 0.90$ .
- b) If 7 cards are dealt from an ordinary deck of 52 playing cards, what is the probability that (5)

- (a) Exactly 2 of them will be the ace cards.  
 (b) At least 1 of them will be a queen.

**Q5**

- a) Find the mean and variance of the binomial distribution? (5)  
 b) Given the normally distributed variable  $X$  with mean 18 and standard deviation 2.5, find (5)  
 (a)  $P(X < 15)$ ;  
 (b) The value of  $k$  such that  $P(X < k) = 0.2236$ ;  
 (c) The value of  $k$  such that  $P(X > k) = 0.1814$ ;  
 (d)  $P(17 < X < 21)$ .

- Q6** a) A machine produces metal pieces that are cylindrical in shape. A sample of pieces is taken, and the diameters are found to be 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 0.99, 1.01, and 1.03 centimetres. (5)

Find a 99% confidence interval for the mean diameter of pieces from this machine, assuming an approximately normal distribution.

- b) The following are the weights (in decagrams) of 10 packages of grass seed distributed by a certain company: (5)

46.4, 46.1, 45.8, 47.0, 46.1, 45.9, 45.8, 46.9, 45.2, 46.0.

Find a 95% confidence interval for the variance of the weights of all such packages of grass seed distributed by this company, assuming a normal population.

- Q7** a) Consider a random sample  $x_1, x_2, \dots, x_n$  from a Poisson distribution. Find the maximum likelihood estimates for  $\mu$ . (5)

- b) A fuel oil company claims that one-fifth of the homes in a certain city are heated by oil. Do we have reason to believe that fewer than one-fifth are heated by oil if, in a random sample of 1000 homes in this city, 136 are heated by oil?

Use a  $P$ -value in your conclusion.

- Q8** a) A machine is supposed to mix peanuts, hazelnuts, cashews, and pecans in the ratio 5:2:2:1. A can containing 500 of these mixed nuts was found to have 269 peanuts, 112 hazelnuts, 74 cashews, and 45 pecans. At the 0.05 level of significance, test the hypothesis that the machine is mixing the nuts in the ratio 5:2:2:1. (5)

- b) The grades of a class of 9 students on a midterm report ( $x$ ) and on the final examination ( $y$ ) are as follows: (5)

x	77	50	71	72	81	94	96	99	67
y	82	66	78	34	47	85	99	99	68

- (a) Estimate the linear regression line.  
 (b) Estimate the final examination grade of a student who received a grade of 85 on the midterm report.

Registration No: 1801106110

B.TECH  
UPCIT303

Total Number of Pages: 02  
Code : 161

**3<sup>RD</sup> Semester Regular Examination 2019-20**  
Formal Language and Automata Theory  
BRANCH: INFORMATION TECHNOLOGY

Max Marks: 70

Time: 3 Hours

Answer Part-A which is compulsory and any five from Part-B.  
The figures in the right hand margin indicate marks.

Part - A (Answer all the questions)

(2 x 10)

Q1

a) Answer the following questions:  
Let  $w$  be any string of length  $n$  in  $\{0,1\}^*$ . Let  $L$  be the set of all substrings of  $w$ . What is the minimum number of states in a non-deterministic finite automaton that accepts  $L$ ?

b) Differentiate between DFA and NFA.

c) Define a grammar,  $G$  which represents even palindromes over the input alphabet  $\{0,1\}$ .

d) When a context free grammar is said to be in GNF.

e) Convert the following into CNF.

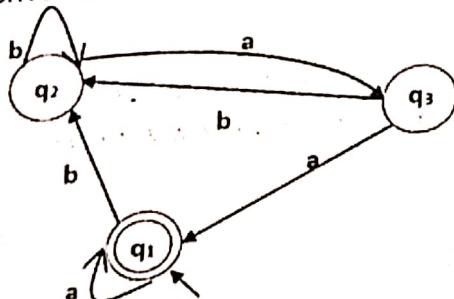
$S \rightarrow bA|aB \quad A \rightarrow bAA|aS|a \quad B \rightarrow aBB|b$

f) Eliminate the epsilon productions.

$S \rightarrow ASa|Bba \quad A \rightarrow a|d \quad B \rightarrow d|ad| \in$

g) State Church-Turing hypothesis.

h) Derive the regular expression for the following DFA.



001000  
0+ 00#1\*00 + 0(0+1)\*000  
0, 0000, 1000

- i) What is post correspondence problem?  
j) Differentiate between recursive and recursively enumerable language.

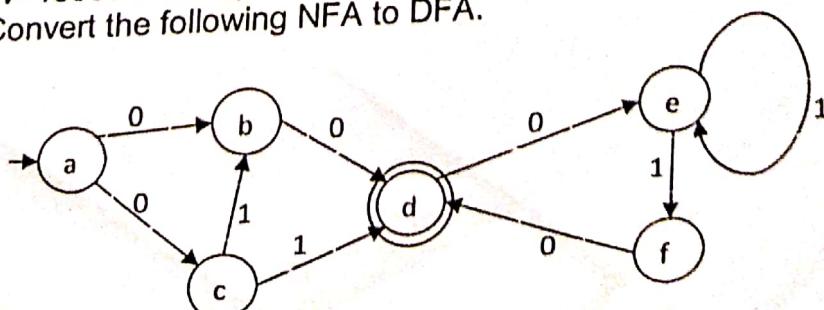
Part - B (Answer any five questions)

(5)

Q2 a) Write down the regular expression which accepts all binary strings divisible by 8. Draw the equivalent DFA. Test whether the string  $W=10000$  is acceptable or not.

(5)

b) Convert the following NFA to DFA.



- Q3** a) State the pumping lemma for regular set. Write down the steps needed for proving that the given set is not regular. Using those steps prove that  $L = \{a^{2n} | n \geq 1\}$  is regular. (5)
- b) Write a regular expression for each of the following sets of binary strings.
- Has at least 3 characters, and the third character is 0
  - Number of 0s is a multiple of 3
  - Starts and ends with the same character
  - Odd length
  - Starts with 0 and has odd length, or starts with 1 and has even length
- Q4** a) Design a push down automation over the input alphabet {a,b} that will accept a language  $L = \{wcw^r | w \in \{a, b\}^*\}$  (5)
- b) Given the following ambiguous context free grammar (5)
- $$S \rightarrow Ab \mid aB$$
- $$A \rightarrow a \mid Aa$$
- $$B \rightarrow b$$
- Find the string s generated by the grammar that has two leftmost derivations. Show the derivations.
- Q5** a) i) Find the language of the given Grammar  $G = \{\{S\}, \{0, 1\}, \{S \rightarrow 0S, S \rightarrow S1, S \rightarrow 1, S \rightarrow 0\}, \{S\}\}$ . (5)
- ii) Find the language of the given Grammar  $G = \{\{S\}, \{0, 1\}, \{S \rightarrow 0S, S \rightarrow S1, S \rightarrow \epsilon\}, \{S\}\}$ . (5)
- Find the language of the given Grammar  $G = \{\{S\}, \{a, b\}, \{S \rightarrow aS \mid bS \mid a \mid b\}, \{S\}\}$ . (5)
- b) Write a short note on Chomsky Classification of Language. (5)
- Q6** a) Design a pushdown automation that will accept a language  $L = \{a^3b^{n+1}c^n | n \geq 1\}$  (5)
- b) Write down the pumping lemma for context free grammar. Show that the language  $L = \{a^p | p \text{ is a prime}\}$  is not a context free language. (5)
- Q7** a) Design a Turing machine M that will accept a language  $L(M) = \{0^n 1^n 2^n | n \geq 1\}$  (5)
- b) Write down the closure properties of context free language. (5)
- Q8** a) Differentiate between P, NP, NP-Complete and NP-Hard problems with suitable example. (5)
- b) Write down atleast five closure properties of recursive and enumerable languages. (5)