



University of Engineering & Management, Kolkata

End Semester Examination, December, 2016

Course: B.Tech (CSE)

Semester: 3rd

Paper Name: Mathematics-III

Paper Code: M301

Full Marks: 70

Date: 16-Dec-2016

Time: 2:00pm – 5:00pm

Group-A

10 Marks

(Each question is of 2 marks. Answer any 5)

1. A) The probability of a student getting first class, second class and third class at an examination are $1/10$, $2/5$, $1/5$ respectively. What is the probability that he fails? (2)
- B) Find the value of $E(X^2)$ when $X \sim N(0,1)$. (2)
- C) Find the mean of the binomial distribution $B(5,2/5)$. (2)
- D) Write Tchebycheff's inequality. (2)
- E) What is the chromatic number of bi-partite graph? (2)
- F) State four color theorem related to graph theory. (2)
- G) Define cyclic group with example. (2)
- H) Find the order of the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 2 & 1 \end{pmatrix}$. (2)

Group-B

15 Marks

(Each question is of 5 marks. Answer any 3)

2. A continuous random variable has a p.d.f. $f(x) = 3x^2$; $0 \leq x \leq 1$. Find a and b such that
 - a) $P(X \leq a) = P(X > a)$
 - b) $P(X > b) = 0.05$. (5)
3. Show that \sqrt{T} is an biased estimator of $\sqrt{\theta}$ when T is an unbiased estimator of θ . (5)
4. The population of scores of 10 year children in a test is known to have a standard deviation 5.2. If a randomly chosen sample of size 20 shows a mean 16.9 find the 95% confidence interval for the mean score of the population assuming that the population is normal. It is given that the area under the standard normal curve between $z=0$ and $z=1.96$ is 0.475. (5)
5. What is kuratowski's second graph? Discuss why it is non planar. (5)
6. Show that the additive group of all integers modulo 5 is cyclic. Find all generators of Z_5 . (5)

Group-C

(Each question is of 15 marks. Answer any 3)

7. A random variable X has the following probability distribution.

X	0	1	2	3	4	5	6	7
P(X)	0	K	2k	2k	3k	K^2	$2K^2$	$7K^2+k$

- a) Find the value of k.
 b) Find $P(X < 6)$.
 c) Find cumulative distribution function of X. (15)
8. a) The smallest value of 'x' for which $P(X \leq x) > \frac{1}{2}$.
 A) On rainy days, Joe is late to college with probability 0.3; on no rainy days, he is late with probability 0.1. With probability 0.7 it will rain tomorrow. Find the probability that Joe is early tomorrow. Given that Joe was early find the probability that it rained.
 B) A petrol pump is supplied with petrol once a day. If its daily volume of sales (X) in thousands of litres is distributed by: $f(X) = 5(1-x)^4$; $0 \leq x \leq 1$, what must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01? (9+6)
9. A) A soft drink company claims that the content of each of its soft drink bottle is 300 ml, as advertised. One consumer suspects that the bottles are underfilled. He measures the 10 bottles as 299.7, 297.1, 298.1, 299.3, 298.8, 297.6, 300.4, 301.5, 301.1, 298.3.
 Are you convinced that the average content of the bottles are really less than the advertised 300 ml? Assume population follows normal distribution with standard deviation 3.5 ml. Test at 5% level of significance.
 Given that the area to the right side of the point 1.645 under standard normal curve is 0.05.
 B) A sample of 200 people has a mean age 21 with a normal population standard deviation 5. Test the hypothesis that the population mean is 18.9 at 5% level of significance. Given that the area to the right side of the point 1.645 under standard normal curve is 0.05.

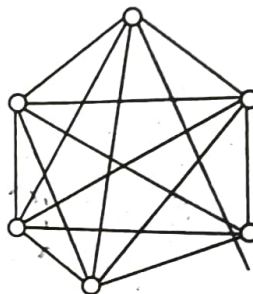
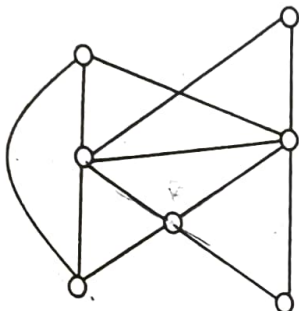
10. A) A manufacturer claims that the thickness of the spearmint gum it produces is 7.5 one-hundredths of an inch. A quality control specialist regularly checks this claim. On one production run, he took a random sample of $n = 10$ pieces of gum and measured their thickness. He obtained:

7.65	7.60	7.65	7.70	7.55
7.55	7.40	7.40	7.50	7.50

What should be the conclusion of the quality control specialist regarding the claim? Test at 5% level of significance. Given that the area to the right side of the point 2.262 under the t-distribution curve with 9 degrees of freedom is 0.025.

B) A random sample $\{65, 71, 64, 71, 70, 69, 64, 63, 67, 68\}$ is drawn from a normal population with standard deviation $\sqrt{7.056}$. test the hypothesis that the population mean is 69 at 1% level of significance. Given that $P(0 < z < 2.58) = 0.95$. (15)

11. Find the chromatic number of the following two graphs and show that these results do not violate the four color theorem.



(15)

12. A) Prove that a group $(G, *)$ is abelian if and only if $(a * b)^{-1} = a^{-1} * b^{-1}$ for all $a, b \in G$.

B) Let S be set of all real matrices $\left\{ \begin{pmatrix} a & b \\ -b & a \end{pmatrix} : a^2 + b^2 = 1 \right\}$. Show that S forms a commutative under matrix multiplication. (15)



University of Engineering & Management, Kolkata

1st Term Examination, September, 2019

Course: B.Tech (CSE)

Semester: 3rd

Paper Name: Digital Logic Design

Paper Code: ESC301

Full Marks: 70

Time: 3 hours

Group-A (10 marks)

Answer any 5. Each question is of 2 marks.

1. A) What is Graycode? Convert gray code 1101 to binary code.
- B) "Multiplexer is also known as Data Selector". Give reason supporting this statement.
- C) Implement XOR gate using NAND gate.
- D) Perform the BCD addition for $(89)_{10}$ and $(98)_{10}$
- E) Subtract using 2's complement subtraction method: $8_{10} - 11_{10}$
- F) What is prime implicant? What is essential prime implicant?
- G) What is Excess-3 code? Why it is known as self complementing code?
- H) Why is Gray code called a unit distance code?

Group-B (15 marks)

Answer any 3. Each question is of 5 marks.

2. Draw and explain the circuit of the 4 bit parallel adder using full adder.
3. Find out simplified SOP (Sum of Product) form of the Boolean expression $(P + Q' + R')$, $(P + Q' + R)$, $(P + Q + R')$
4. Design and explain 4:2 priority encoders.
5. Design 8:1 multiplexer using 4:1 multiplexers and any other logic gate if required.
6. Implement 3 bit even and odd parity generator using basic gates.

Group-C (45 marks)

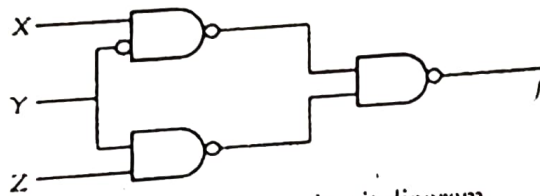
Answer any 3. Each question is of 15 marks.

7. A) What is BCD code? Classify different types of codes.
- B) Design and explain a BCD to XS-3 code converter and draw the logic diagram only using basic gates.
- C) Implement the logic function $F(A,B,C,D) = \sum m(0,1,3,4,8,9,15)$ using 8:1 Multiplexer.

1+3+7+4

8. A) Implement with a proper explanation a Full Adder circuit using Decoder along with the truth table.
 B) Define minterm and maxterm.
 C) Simplify the following function using Karnaugh map
 $F(A,B,C,D,E) = \Sigma (0,1,2,3,4,7,8,11,12,15,16,17,19,20,21,22,23,24,25,27,28)$ 6+2+7
9. A) Design and explain the full adder circuit using two half adder circuits and any other logic gate if required.
 B) Draw and explain the circuit of the 4 bit parallel adder using full adder.
 C) Design octal to binary encoder using basic gates. 5+5+5
10. A) Design a combinational logic circuit for the function $f = AB + AC$ using 4:1 multiplexer.
 B) Implement 2 bit magnitude comparator using basic gates.
 C) Simplify the function using Karnaugh map
 $F(A, B, C, D, E) = \Sigma (0, 1, 2, 4, 5, 7, 11, 15, 20, 24)$ 5+7+3

11.



- A) Find out the expression of "f" for the above circuit diagram.
 B) Design a 4 line data bus using suitable multiplexer where data from 4 registers are transferred to required places, each register can hold 4 bits of data.
 C) Find out the expression of "F" for the below circuit diagram. 5+7+3

