भारतीय सूचना प्रौद्योगिकी संस्थान कोटा
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (ECE/CSE), Semester – I
End-Term Examination– 2023

Digital Design (ECT101)

Marks: 40 Time: 120 minutes Date: February 24, 2023

Note: *There are two parts in the question paper. Part-A and Part-B each for TWENTY marks. Part-A has TEN Questions each carries TWO marks. Answer all the questions in Part-A at one place and in numerical order. Part-B has FOUR questions and each carry FIVE marks. Answer all the questions of Part-B at one place. All questions are compulsory. Any missing data may be assumed suitably.*

PART- A

Answer all the questions of Part-A at one place and in order. Write only the final answer

Q1. The minimum number of 2:1 multiplexers needed to implement a two-bit binary multiplier is _____. Given, the inputs are available only in true form.

Q2. To implement a full subtractor using a 3 to 8 decoder with active low outputs, the additional logic gates required would be two four input _____ gates. (NAND/NOR/OR-AND).

Q3. To operate a J-K flip flop in toggling mode, what is the correct pair of input combination for J and K?

Q4. What is the minimum number of 2:1 multiplexers needed to implement a 32:1 multiplexer?

Q5. How many usable states are there in n-bit Jhonson counter.....?

Q6. Find the correct match from each item of Group A with the most appropriate item in Group B.

Group A	Group B
(a) Counter	(w) Addressing in memory chips
(b) Decoder	(x) Data selector
(c) Multiplexer	(y) Serial to parallel data conversion
(d) Shift Register	(z) Frequency division

Fig. 1

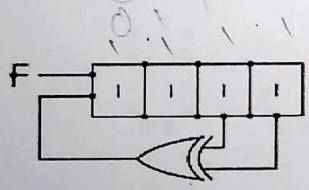


Fig. 2

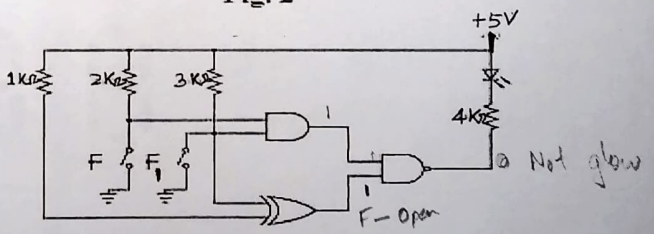


Fig. 3

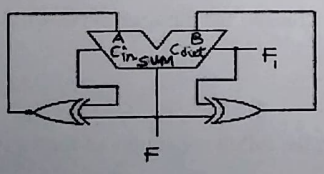
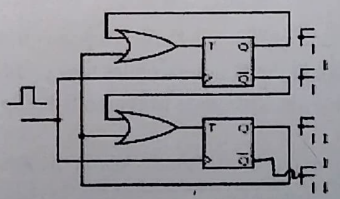


Fig. 4



Q7. Find the contents of the Shift Register after three clock pulses are applied. Suppose the initial contents of the 4-bit serial-in-parallel-out, right-shift, Shift Register is 1111 as shown in Fig. 1.

Q8. In Fig. 2, for what possible conditions of switches F and F_1, Light Emitting Diode (LED) will glows or remains off?

Q9. Assume a full adder with SUM as AB, input carry $C_{in} = \overline{A} + B$ and output carry C_{out} as $A \oplus B \oplus C_{in}$. Find subsequent outputs F and F_1 of a given logic circuit as shown in Fig. 3.

Q10. Derive the state table and state diagram of the sequential circuit with a clock (F) and T flip flops in Fig. 4.

Part- B

Q1. Pink-city **O**ffice and **H**ome **A**ppliances (POHA),is a new start-up which manufactures and sells Appliances for Home and Office. This company is designing a new Tea/Coffe Vending Machine for which they need an electronic display to indicate the state of the machine. The machine can be in one of the eight possible states. A (Amount collection), C (cleaning), E (Error), F (Fault) H (Hibernate/Idle), P (Preparing), L (Loading Ingredients) and U (Unloading Tea/Coffee to the cup). A young engineer, Abhi has decided to use the seven segment LED for this purpose (refer the Fig5). Give the truth table and implement the circuit using minimum number of only two input Gates and Not Gate. The Inputs are available only in True form. An LED is on when the corresponding Bit is 1. Assume the state of the machine is three-bit (PQR) binary encoded.

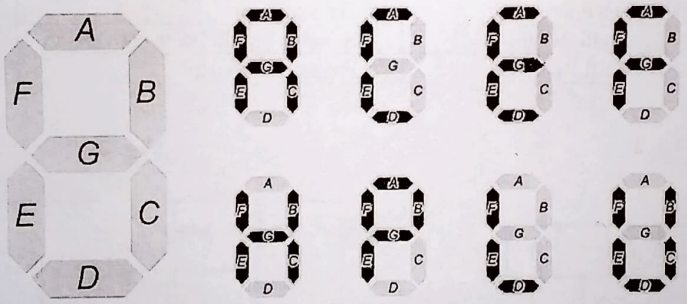


Fig. 5

Q2. Explain the Master-Slave Flip-Flop. How it overcome the race condition of J-K flip-flop. Use proper logic diagram.

Q3.(a) Assuming that a J-K flip-flop was initially cleared and then clocked for 6 pulses What will be the sequence at the Q output under the condition that $J = \bar{Q}$ and $K = 1$. [3]

(b) Realize a negative edge triggered S-R flip flop to T flip flop. [2]

Q4. Design an arbitrary counter using the J-K flip flop by traversing the following counts as shown in Fig. 6.

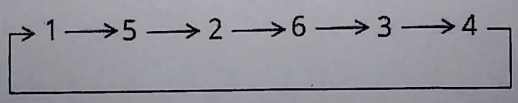


Fig. 6

Indian Institute of Information Technology, Kota

Department of Mathematics

End Term Examination (MAT-101: Mathematics I)

March 1, 2023

Time. 120 Minutes — Max. Marks 40

All questions carry equal marks.

1. Trace the curve $a^2y^2 = x^2(2a - x)(x - a)$, $a > 0$ using salient features of it.

2. Find the rank of the coefficient matrix of the given system of homogeneous equations using elementary operations and hence find the solution

$$\begin{aligned} x_1 + x_2 + x_3 + x_4 &= 0, \\ x_1 + 3x_2 + 2x_3 + 4x_4 &= 0, \\ 2x_1 + x_3 - x_4 &= 0. \end{aligned}$$

3. Evaluate the integral $\int_1^2 e^{x^3}\, dx$ using Simpson's $1/3^{rd}$ rule by taking four subintervals.

4. Using interpolation, find a polynomial $p(x)$ that satisfies the following data and hence find $p(10)$ from the following table.

x	5	6	9	11
y	12	13	14	16

5. Evaluate the integral by changing the order of integration $\int_0^\infty \int_0^x xe^{\frac{-x^2}{y}}\, dydx$.

6. Show that the volume of solid of revolution of a circle $x^2 + y^2 = a^2$ about x-axis is the volume of a sphere.

7. Solve the differential equation $\dfrac{d^4y}{dx^4} + 2\dfrac{d^2y}{dx^2} + y = x^2 \cos x$.

8. Knowing that $y = x$ is a solution of the reduced homogeneous equation of

$$x^2\frac{d^2y}{dx^2} - x(x+2)\frac{dy}{dx} + (x+2)y = x^3,$$

solve it by reducing it to a first-order linear equation.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech Sem I (CSE, ECE)

End Term Examination, Odd Semester 2022-23

Communication Skills (HST 101)

Marks: 40 (Weightage: 40 %) **TIME: 2 Hrs.** **Date: 28th Feb, 2023**

Instructions: The paper consist of 3 sections, all sections are compulsory.

Section A: Grammar **(15 marks)**

1. **Identify the error and rewrite the correct sentence.** **(2)**
   a) Between you and I there is a strong bond of trust.
   b) I went to meet my cousin sister who studied in London. She is a Doctor.
2. **Change the sentences from active voice to passive voice:** **(2)**
   a) They finished the work.
   b) I know the fact.
3. **Put the correct punctuation in the sentence:** **(2)**
   a) I will not go to the stadium said the captain of the team
   b) Alas the old woman is dead said the doctor
4. **Fill in the blank with appropriate one word substitutions:** **(2)**
   a) A person's first speech.....
   b) A person living in the same time as another.....
5. **Complete the following conditional sentences.** **(2)**
   a) If you don't like films why----------
   b) I would have been able to win the match if----------
   c) Your job sounds awful! If I were you ----------
   d) The milk would have turned sour if----------
6. **Use a prefix/ suffix to make a new word out of the word in the brackets.** **(2)**
   a) The meat was superb but the pasta was completely____(cook) and tasted like wet cardboard.
   b) I used to work for a large _____ (profit) organization that worked to improve education provision.
   c) Some of the shanty towns are dreadfully _____. (Crowd)
   d) There were only a _____ . (hand) of people at the match.
7. **Insert the correct form of verbs in the blanks given below:** **(3)**
   a) It's a beautiful drive. I am sure you _____ the scenery. (enjoy)
   b) He _____the bagpipes since six this morning. (play)
   c) While we _____ someone _____ into the house and left us this note. (fish, break).
   d) It _____ (rain) since last night, and it _____ (look) as if it may rain for the rest of the day.

Section B: Critical Appreciation (10 marks)

8 . Answer any 4 questions in about 60-70 words. Each question is of 2.5 marks:

a) Elaborate on six pillars of self- esteem?
b) What is the main theme of "Animal Farm"? What is its relevance in the present time?
c) Give an account of Kalam's spirituality. How does he rise above the narrow confines of religion and reveal his faith in one God?
d) Define Self Esteem? How does it impact the destiny of an individual?
e) Do you think Anne's Journal was a great support during the most difficult period of her life? Critically analyze the journal written by her.

Section C: Writing Skills (15 marks)

9. Assuming that you are the Head of the Music Club of your college and you want your college to represent in an Intercollegiate Music Competition to be organized at IIT, Hyderabad, write an e-mail to the Organizing Secretary enquiring all the details about the competition. (3)

10. Expand ANY ONE of the following ideas in 70 words : (4)

Human Ethics / Borderless World / Technology eroding privacy

11. Read the passage and answer the following questions: (8)

This year, for the first time, women make up 30% of the IIT-JEE applicant pool. This is entirely good news, because JEE results have long been grim advertisements for glaring gendered disparity. Girls routinely outperform boys in boards and medical entrance. That JEE has remained a hurdle was partly because many girls didn't even try. The reasons for this gender gap are complex. It is not differences in innate ability or a lack of interest in scientific and technical education. Implicit biases and the lack of role models might be central to the scarcity of women in science in the West, but in India, women make up 43% of the STEM education pool, one of the highest ratios in the world. The government has made active interventions to spark girls' interest in STEM study, and institutions are assessed for their gender inclusion. IITs have tried to mend the gap too – the horizontal 'supernumerary' quota gives women who have passed the JEE Advanced an edge in courses of their choice and has taken the presence of women to 20% on IIT campuses, a visible improvement. The reluctance to aim for the IITs, then, is not rooted in individual psyches as much as social constraints, and in the design of the high-stakes JEE. The exam, which usually involves years of intensive coaching in faraway locations, did not just filter out girls, it has also been skewed against students from rural and lower-income backgrounds. If the IITs are to be a magnet for India's brightest minds in science and technology, they must make sure that social disparities don't come in the way of talent.

a. Mention the reasons for the gender gap in the IIT JEE applicant pool. (2)
b. Describe some steps taken by the government to curb gender disparity in education sector. (2)
c. What are the social constraints faced by women while pursuing education? (2)
d. Find words from the passage that mean : (2)
   1) intrinsic
   2) criticize loudly

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (CSE+ECE), Semester – I
End Term Examination, Odd Semester 2022-23

Circuit Theory (ECT103)

Marks: 40 (Weightage – 40%) **Time: 120 minutes** **Date: February 27, 2023**

Note: Attempt all questions in sequence. Attempt all parts of a question at one place. Show all thesteps.

1. Determine the variables v_1 and i_1 for the circuit shown in Fig. A. [4]

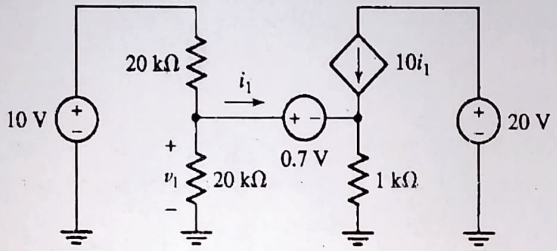


Fig. A

2. Use Y-Δ and Δ-Y transformations to find the input resistance of the network shown in Fig. B. [6]

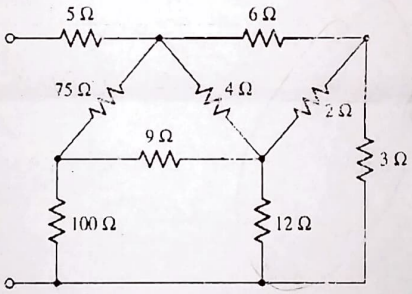


Fig. B

3. Consider the circuit shown in Fig. C. Assume $I = 3.6$ mA (rms), $R = 500\ \Omega$, $C = 0.4\ \mu$F, $L = 16$ mH.

i. Determine the resonant frequencies in rad/s.
ii. Find the Q-factor of the circuit at resonance.
iii. Calculate the phasor voltage across the circuit (V) and phasor currents (I_R, I_L, I_C) at resonance.
iv. Determine the bandwidth of the circuit in Hz.
v. Sketch the properly labeled voltage response of the circuit, showing the voltage at the half-power frequencies. [1+1+2+1+3 = 8]

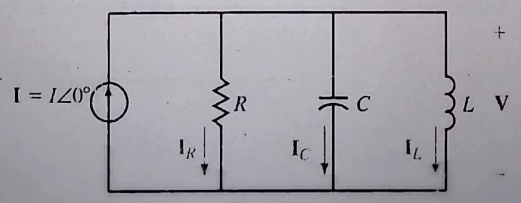


Fig. C

Indian Institute of Information Technology Kota

Department of Computer Science and Engineering

End Term Examination (February 2023)

Computer Science and Programming CST101)

Duration:2 hrs Max Marks: 40

Note: Please attempt all the parts of a question together. Do not write unnecessary theory.

Q1. State whether each of the following is true or false. **4 marks**

A. An expression containing the || operator is true if either or both of its operands is true.

B. All arguments following the format control string in a printf function must be preceded by an ampersand (&).

C. If there are fewer initializers in an initializer list than the number of elements in the array, the remaining elements will contain garbage values.

D. Structures contain variables of only one data type.

Q2. Write very short answers to the following: **10 (2+2+2+2+4) marks**

A. Write two different ways to initialize character array **'vowel'** with the string of vowels "AEIOU".

B. Write a loop that adds all the elements of the array n[10] and stores the result in total.

C. Write a function that takes an integer and returns the sum of its digits. For example, given the number 7631, the function should return 17.

D. Write the differences between

1. Break and continue
2. Structure and Union
3. Iterative and recursive functions
4. Bitwise and logical operators

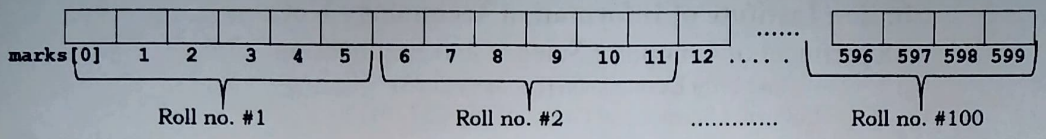
Q3 (a). What does this program do? **2 marks**

```
int my_str(char p[])
    {
      char *q = p;
       while (*q)
       q++;
       return q-p;
    }
```

(b) Write a program in C that uses a user-defined function swap ( ) and interchange the value of two variables using pointers. (Call by reference) **4 marks**

Q4. Write a program to add two rational numbers using structure. Represent each rational number as a structure having a numerator and denominator as its member variable. **4 marks**

Q5. A group of one hundred students have their roll numbers that run from 1 to 100, reflecting their admission rank. The array **marks** is used to store contiguously the marks they obtained in six registered courses, as shown below:



The function **getMarks()** (whose partial implementation is shown below) obtains the marks of each of the *no_courses* courses for all the *no_studs* students (from roll no. 1 to 100, in that order) and stores in the array *marks*. Complete the outer and inner *for* loops (line #3 and #6), as well as the assignment statement in line #9 to complete the function. **3 marks**

```
void getMarks(float *marks, int no_studs, int no_courses)
{  int i, j, index;
    for (_____) // line #3
    {
      printf("\nRoll no. %d...\n", i+1);
      for (_____)     // line #6
            {
              printf("\tObtaining marks for course no. %d:\n", j+1);
              index = _____; // line #9
              scanf("%f", &marks[index]);
            } /* inner for loop */
    } /* outer for loop */
    return;
}
```

Q6. Write a program that estimates the value of the mathematical constant e by using the formula: **5 Marks**

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \text{.....}$$

Q7. Predict the output of the following program/code. **8 Marks**

//A. #include <stdio.h> int main(){ int a= -1,b = -a; int x,y; x = (a> 0) && (b < 0) || (a< 0) && (b > 0); y = (a<= 0)||(b >= 0)&&(a>= 0)||(b <= 0); printf("%d\n",x == y); return 0; }	**//B .** #include <stdio.h> #include <string.h> int main(){ . char str[20] = "MNITJAIPUR"; int s = strlen(str); str[3] = '\0'; s = strlen(str); printf("%d\n",s); return 0; }
//C #include<stdio.h> int main() { char str[]="CST101"; int a = 5; printf(a >10?"Ps\n":"%s\n", str); return 0; }	**//D** #include<stdio.h> int main() { int i; i= 0x05+ 010+10; printf("\nx=%x", i); return 0; }