SH-III/Electronics-301C-5(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

ELECTRONICS

Course ID : 31711 **Course Code : SHELC-301C-5(T)**

Course Title : Electronic Circuits

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any three* of the following: 1×3=3

(a) Draw the forward and reverse characteristics of an ideal diode.

(b) Draw the block diagram of a Zener diode based power supply.

Or,

What is an electronic filter?

(c) Draw the circuit diagram of a voltage divider method of biasing with *n-p-n* transistor.

(d) What is Darlington pair?

(e) What is feedback in an Amplifier?

(f) What is class A operation?

Or,

What is the maximum conversion efficiency of a class A power amplifier?

2. Answer *any three* of the following: 2×3=6

(a) What is ripple factor (γ)? What is its value for a half wave and for a full wave rectifier circuit? 1+1=2

(b) Show the output waveform of a full wave rectifier when the input is a sinusoidal wave.

(c) Draw and explain both dc and ac load line for a transistor based CE amplifier.

Or,

Give the *h*-parameter based model of an Amplifier in CE configuration.

(d) What are 'Barkhousen criterian' for the condition of oscillations?

Or,

What is 'sustained oscillation'? What is the condition for this type oscillation?

(e) How many types of power amplifiers are there? Classify them according to their nature of operation. 1+1=2

Or,

What are the basic difference between a Voltage Amplifier and a Power Amplifier?

(f) What is quality factor (Q) of a tuned amplifier? How is it related to bandwidth (Δf) of the same amplifier?

3. Answer *any two* of the following: 5×2=10

(a) Derive the expression for ripple factor (γ) and rectification efficiency (η) for a full wave rectifier circuit.

Or,

Draw the circuit diagram of a zener diode based voltage regulator circuit and explain it. What are load and line regulation? 4+1=5

(b) Derive an expression for voltage gain of a CE-Amplifier in the mid frequency range with *h*-parameter ac equivalent circuit.

Or,

How the individual gain of a CE-Amplifier is being effected/changed during Cascading with other amplifiers? Derive its expression from *h*-parameter ac equivalent circuit. 1+4=5

(c) With proper circuit diagram obtain an expression for the frequency of generated signal for an R-C 'phase shaft' oscillator. What type of frequencies are generated by this oscillator? 4+1=5

Or,

Draw the circuit diagram of class-B push-pull power amplifier circuit. Explain briefly about its operation and obtain the expression for conversion efficiency (η). 1+1+3=5

(d) Draw the circuit diagram of a single tuned voltage amplifier circuit. Obtain its *h*–parameter ac equivalent circuit. Hence obtain the expression for measure voltage gain for this type of amplifier. 1+1+3=5

4. Answer *any one* of the following questions: 6×1=6

(a) What are clipping and clamping circuits? How many types of clipping circuits are there? With proper circuit diagram describe the operation of a clipper. 2+1+3=6

Or,

Draw the circuit diagram of either a centre-tapped /or a bridge type full-wave rectifier circuit and hence draw its output wave-form. What is PIV (Peak Inverse Voltage)? 3+2+1=6

(b) With proper circuit diagram explain the working principle of either a Hartley or a Colpitt oscillator. Obtain the expression for generated frequency of the same oscillator. Give one application of it. 5+1=6

(c) Draw and explain the operation of complementary symmetry class-B push-pull power amplifier. What is Harmonic distortion? 5+1=6

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SH-III/Electronics-302C-6(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

ELECTRONICS

Course ID : 31712 **Course Code : SHELC-302C-6(T)**

Course Title : Digital Electronics and Verilog (VHDL)

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any three* of the following: 1×3=3

(a) What are minterm and maxterm?

(b) How many Half adders and Full adders will be required to add two 32-bit numbers?

(c) What is sequential logic circuit? Give one example.

(d) What is the difference between a decoder and a demultiplexer?

(e) Draw the logic circuit of 1-bit comparator.

(f) Mention the name of logic gate which is used as equality detector.

2. Answer *any three* of the following: 2×3=6

(a) What is sign magnitude representation? Represent $(-15)_{10}$ in this representation. 1+1=2

(b) What is 'Propagation delay time' and 'fan out' of a logic gate? 1+1=2

(c) What do you mean by 'Bipolar' and 'Unipolar' logic families? Give one example of each. 1+1=2

(d) Convert in standard SOP form— $Y = AB + A\bar{C} + BC$. 2

(e) What is shift register? Mention its two applications. 1+1=2

(f) What do you mean by self complementing codes? Name two self complementing codes. 1+1=2

3. Answer *any two* of the following: 5×2=10

(a) Perform the following:

(i) $(AF.B9)_{16} = (?)_8$

(ii) $(1011011)_2 = (?)_{Gray}$

(iii) $(459.23)_{10} = (?)_{xs3}$

(iv) $(776)_8 + (567)_8$

(v) $(106.45)_{10} = (?)_8$

(b) Perform the following:

(i) $(-5)_{10} + (-4)_{10}$ using 1's complement method.

(ii) $(15)_{10} - (21)_{10}$ using 2's complement method. 2½+2½=5

(c) Explain CMOS Inverter with proper circuit. Compare CMOS and TTL logic families. 3+2=5

(d) Draw the logic symbol of clocked R-S flip-flop and give its truth-table. How will you get D and T flip-flop from JK flip-flop? 2+2+1=5

Or,

What is Full subtractor? Write down its truth table. Implement a Full subtractor using Demultiplexer. 1+1+3=5

4. Answer *any one* of the following questions: 6×1=6

(a) Explain the working of a Half subtractor with logic diagram and truth table. Realize it using NOR gates only. 3+3=6

(b) Minimize the following expression using K-Map and realize using NOR gates only. f (P, Q, R, S,) = $\prod$ M (1, 4, 6, 9, 10, 11, 14, 15). 4+2=6

(c) Implement the following Boolean expression using multiplexer:

$Y = (A + B)\,(\overline{A} + B + C)\,(A + \overline{B})$ 6

Or,

Design MOD-10 counter using JK flip-flop and explain its operation in brief. Draw its timing diagram. 4+1+1=6

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SH-III/Electronics-303C-7(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

ELECTRONICS

Course ID : 31713 **Course Code : SHELC-303C-7(T)**

Course Title : C Programming and Data Structures

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any three* of the following: 1×3=3

(a) Why do we need to use 'comment' in a program?

(b) What is an array?

(c) What is the meaning of '\n' in C program?

(d) What do you mean by 'keywords' in C language.

(e) What is 'Structure'?

(f) State various data types in C language.

2. Answer *any three* of the following: 2×3=6

(a) Define and explain scanf () or printf () functions.

(b) What do you mean by 'local variables' and 'global variables'? 1+1=2

(c) Define string. Mention four important string handling functions in C. 1+1=2

(d) What do you mean by 'Precedence' and 'Associativity of Operators'? 1+1=2

(e) Explain the term 'user defined function' and 'built-in function' with example.

(f) Mention two rules in naming variables in C program.

3. Answer *any two* of the following: 5×2=10

(a) List different types of decision making statements in C language. Explain any one of these with example. 2+3=5

(b) Write a C program to input the elements of two 3 × 3 matrices and find their multiplication. 2+3=5

(c) Explain 'break' and 'continue' statement in C program with example. 2½+2½=5

(d) What is a loop? What is the difference between 'while' and 'do-while' loop in C? Explain any one with an example. 1+1+3=5

4. Answer *any one* of the following questions: 6×1=6

(a) Write a C program to accept a number from the user and check whether given number is present or not using linear search algorithm.

(b) Write a program to arrange *n* elements in descending order using Bubble sort algorithm.

(c) What is recursion? Write a C program to find factorial of an integer using recursion. 1+5=6

Or,

Define function. Describe its general format. Explain function with argument and no return value with one example.

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SH-III/Electronics-305SEC-1(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

ELECTRONICS

Course ID : 31715 **Course Code : SHELC-305SEC-1(T)**

Course Title : Programming with MATLAB

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* of the following: 2×5=10

(a) What will be output of the following MATLAB command?

```
>> A = [2 3 5];
>> B = [1 4 7];
>> C = A· * B.
```

(b) Write MATLAB expressions for the following:

(i) $\sin^2(\pi/6) + \cos^2(\pi/6)$

(ii) $x(t) = e^{-0\cdot 2t}\cos(2t)$ 1+1=2

(c) Give the general format of 'fprintf' command.

(d) Write MATLAB script file for the polynomial $f(x) = x^5 - 2x^4 + 4x^3 - 7x^2 - 7x$ to calculate *f*(2).

(e) Write two ways to display the following matrix A = $\begin{bmatrix} 3 & 4 & 5 & 6 & 7 \\ 9 & 12 & 15 & 18 & 21 \end{bmatrix}$.

(f) Compare script file with function file.

(g) Using the line space function, create the following vectors:

(i) $4 \quad 6 \quad 8$

(ii) $-3 \quad -6 \quad -9 \quad -12 \quad -15$ 1+1=2

(h) Assume $a = 20, b = -2, c = 0, d = 1$. What will be the output of the following:

(i) $a > b \;\&\&\; c > d$

(ii) $a \;\&\&\; b + d > c$.

2. Answer *any four* of the following: 5×4=20

(a) Explain structure of function file. Write a MATLAB function to calculate the distance between two points (x_1, y_1) and (x_2, y_2) in Cartesian Coordinate System. 2+3=5

(b) Write down the script file to solve the following system of linear equations using Matrix Inversion method.

$2x + 3y - 4z = 5, y + 4z + x = 10, -2z + 3x + 4y = 0.$

(c) Write a MATLAB program to print the sum of ODD numbers from 1 to N (given by the user).

(d) Write a MATLAB program to print the division corresponding to the marks obtained by a student.

Marks > = 60	First
45 < = Marks < 60	Second
30 < = Marks < 45	Third
Marks < 30	Fail

(e) Give the MATLAB Command to plot, on the same figure, the two functions

$f = 3t^2 + 2t - 0 \cdot 5$ and $g = 2t \cos t$

where the variable t varies from 0 to 10 with step 0·5. Draw the function f in blue with marker * and the function g in red with marker =. Give title to your graph and label the axes.

2+2+1=5

(f) Write a MATLAB program to calculate the sum of all integers from 1 to N.

3. Answer *any one* of the following: 10×1=10

(a) Explain 'if-end' structure in MATLAB. Write a MATLAB program to evaluate a function for any two user specified values x and y. The function is defined as follows:

$$\begin{aligned} f(x,y) &= x + y \quad , \quad x \geq 0 \text{ and } y \geq 0 \\ &= x + y^2 \quad , \quad x \geq 0 \text{ and } y < 0 \\ &= x^2 + y \quad , \quad x < 0 \text{ and } y \geq 0 \\ &= x^2 + y^2 \quad , \quad x < 0 \text{ and } y < 0. \end{aligned}$$

2+8=10

(b) Explain 'while-end' and 'for-end' loops used in MATLAB. Write MATLAB program to calculate the factorial of a number using both 'while-end' and 'for-end' loop. 2+4+4=10

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SH-I/Electronics-301C-5(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

ELECTRONICS

Course ID : 31721 **Course Code : SHELC-301C-5(P)**

Course Title : Electronics Circuit Lab

Time: 1 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

One student to perform only one practical/experiment from the given list.

1. Study the circuit of a half wave rectifier in the given bread board. Measure the output voltage across the load with the veriation of the input voltages. Repeat the experiment by using a capacitor filter. Show your observation graphically.

2. Study the circuit of a half wave rectifier in the given bread-board. Measure the output voltages across a variable load for fixed input voltages. Repeat the experiment by using a capacitor filter. Show your observation graphically. Plot percentage regulation versus load graph.

3. Study the circuit of a full wave rectifier in the given bread-board. Measure the output voltages across the load with the variation of input voltages. Repeat the experiment by using a capacitor filter. Show your observations graphically.

4. Study the circuit of a full wave rectifier in the given bread-board. Measure the output voltages across a variable load for fixed input voltages. Repeat the experiment by using a capacitor filter. Show your observation graphically. Plot percentage regulation versus load curve.

5. Study a Zener diode based voltage regulation circuit. Sketch load regulation and line regulation graph.

6. Study a single stage CE amplifier circuit by measuring the output voltage with the variation of input signal's frequency for a fixed input voltage. Draw the frequency response curve of the amplifier. Calculate half power frequencies and bandwidth from that curve.

7. Study a single stage CE amplifier circuit by measuring the output voltage with the variation of input signal strength for a fixed frequency. Draw the frequency response curve of the amplifier. Calculate half power frequencies and bandwidth from that curve.

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SH-I/Electronics-302C-6(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

ELECTRONICS

Course ID : 31722 **Course Code : SHELC-302C-6(P)**

Course Title : Digital Electronics and Verilog/VHDL (Practical)

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Design, AND, OR, NOT and NOR gates using NAND gates only and verify their truth tables.
2. Design, AND, OR, NOT and XOR gates using NOR gates only and verify their truth tables.
3. Build a Flip-Flop Circuit (RS/Clocked RS/D-type) using gates and verify their truth tables.
4. Design a Half Adder using NAND/NOR gates and verify its truth tables.
5. Design a Full adder using NAND/NOR gates and verify its truth tables.
6. Design a Half Subtractor using NAND/NOR gates and verify its truth tables.
7. Design a Full Subtractor using NAND/NOR gates and verify its truth tables.
8. Design a 4×1 Multiplexer using gates and verify its truth tables.
9. Design a MOD-10 counter using D/T/JK Flip-Flop and obtain its timing diagram.
10. Design a shift register and study serial and parallel shifting of data.

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SH-III/Electronics-303C-7(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

ELECTRONICS

Course ID : 31723 **Course Code : SHELC-303C-7(P)**

Course Title : C Programming and Data Structure

Time: 3 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Write a C program to generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Write a C program to find minimum and maximum of N numbers.
3. Write a C program to find the GCD of two integer numbers.
4. Write a C program to calculate factorial of given number.
5. Write a C program to find all the roots of a quadratic equation $Ax^2 + Bx + C = 0$ for non–zero Coefficient A, B and C. Else report error.
6. Write a C program to calculate the value of $\sin(x)$ and $\cos(x)$ using the series. Also print $\sin(x)$ and $\cos(x)$ value using library function.
7. Write a C program to generate and print prime numbers up to an integer N.
8. Write a C program to sort given N numbers in ascending/descending order using insertion sort/Bubble sort/Selection sort algorithm.
9. Write a C program to find the sum and difference of two matrices.
10. Write a C program to find the product of two matrices.
11. Write a C program to find the transpose of given M × N matrix.

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