SH-V//ELC/501C-11(PR)/19

B.Sc. 5th Semester (Honours) Practical Examination, 2019-20

ELECTRONICS

Course ID : 51721 **Course Code : SH/ELC/501C-11(P)**

Course Title: Microprocessor and Microcontrollers

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

The figures in the margin indicate full marks.
The questions are of equal value.

Answer any one *question.*

1. Write an assembly language program to perform to transfer a block of data.

2. Write an assembly language program to porform multibyte addition.

3. Write an assembly language program to perform multibyte subtraction.

4. Write an assembly language program to multiply two 8-bit numbers.

5. Write an assembly language program to generate terms of Fibonacci series.

6. Write an assembly language program to find the square root of an integer.

7. Write an assembly language program to find the minimum and maximum among N numbers.

8. Write an assembly language program to find the GCD of two numbers.

9. Write an assembly language program to sort numbers in ascending/descending order.

10. Write an assembly language program to verity the truth table of logic gates.

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B.Sc. 5th Semester (Honours) Examination, 2019

ELECTRONICS

Course ID : 51712 **Course Code : SH/ELC/502/C-12(T)**

Course Title : Electromagnetics

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) If $\vec{A} + \vec{B} + \vec{C} = \vec{0}$, the show that $\vec{A} \times \vec{B} = \vec{B} \times \vec{C} = \vec{C} \times \vec{A}$

(b) What is is Lenz's law?

(c) What is an electric dipole?

(d) State the differential from of Gauss law in Electrostatics.

(e) If $\vec{A} = \hat{\imath} + \hat{\jmath}$ and $\vec{B} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$, find $(\vec{A} \times \vec{B})$.

(f) What amount of energy is stored by a charged capacitor (C) at a potential (V)?

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

(a) State Gauss's divergence theorem.

(b) Define Poynting rector. How is it related with energy flux?

(c) What are different modes of radio wave propagation?

(d) State Faradays Laws of electromagnetic induction.

(e) What is the flux of electric field in intensity $[\vec{E}(\vec{r})]$?

(f) What is motional e.m.f.? What type of e.m.f. is it?

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

(a) Starting from Maxwell's equation derive the wave equations for electric $(\vec{E})$ and magnetic $(\vec{B})$ fields in free space.

(b) How Ampere's circuital law has been modified in Maxwell's equation?

(c) (i) What do you mean by characteristic wave impedance (Z_o) of a medium? What is the value of this Z_o in free space for a TEM (e.m.wave) wave?

(ii) Define magnetic scalar potential.

(d) Show that if two coils having co-efficients of self inductance L_1 and L_2 are mutually coupled, then the co-efficient of mutual inductance can be obtained $= k\sqrt{L_1 L_2}$. What is K?

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

(a) Show that in a homogeneous isotropic dielectric medium of permitiuity ϵ and permeability μ, the velocity of e.m. wave propagation is gien by $v = \frac{1}{\sqrt{\mu\epsilon}}$.

(b) What as magnetic dipole? Derive an expression for the force acting on a magnetic dipole placed in a nonuniform magnetic field.

(c) In an airfilled wave guide radio wave is propagating in TE mode. Find out the cut off frequency, phase velocity and the characteristic/wave impedance for the particular case. State the necessary formula for the same.

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SH-V/Electronics-501C-12(PR)/19

B.Sc. 5th Semester (Honours) Practical Examination, 2019

ELECTRONICS

Course ID : 51722 **Course Code : SH/ELC/502/C-12(P)**

Course Title : Electromagnetics

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. Calculate the gradient of scalar $\emptyset$ where $\emptyset = x^2yz$. Calculate the gradient of this scalar $\emptyset$ at (2, –2, 1). Pvove that curl of gradient of this scalar field is zero. i.e. $\nabla \times \nabla\emptyset = 0$. Verify your answer using MATLAB/SCILAB.

2. Convert the given Cartesian coordinate (–2, 6, 3) into equivalent cylindrical and spherical coordinates. Verify your answer using MATKAB/SCILAB.

3. Consider two vectors defined by $\vec{A} = 2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$ and $\vec{B} = \hat{\imath} + 2\hat{\jmath}$. Determine:

(i) Magnitude of A and B (ii) Scalar product of A and B and (iii) Angle between A and B. Verify your answer using MATLAB/SCILAB.

4. Determine the divergence and curl of position vector $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$. Show that the divergence of the curl of this vector field is 0. Verify your answer using MATLAB/SCILAB.

5. Express the vector field $A = 3u_x + 4u_y + 5u_z$ in cylindrical and spherical coordinates. Verify your answer using MATLAB/SCILAB.

6. Plot the surface $Z = \frac{xy(x^2-y^2)}{x^2+y^2}$ over the domain $-4 \leq x \leq 4, -3 \leq y \leq 3$. Use the 'meshgrid', 'plot 3', 'meshc', and 'surfc' commands.

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SH-V/Electronics-503DSE-1(T)/19

B.Sc. 5th Semester (Honours) Examination, 2019

ELECTRONICS

Course ID : 51716 **Course Code : SH/ELC/503/DSE-1(T)**

Course Title : Power Electronics

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 is power electronics?

(b) IGBT is a voltage controlled device. Why?

(c) What is phase controlled rectifier?

(d) How can a thyristor be turned off?

(e) What do you mean by delay angle?

(f) What is meant by commutation?

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

(a) What is the difference between power diode and signal diode?

(b) Define latching current and holding current.

(c) What is a snubber circuit? Why it is used?

(d) What is a thyristor? How has this term been coined?

(e) Give the full form of the following: SUS, LASCR, GTO, MCT.

(f) What is the turn-off time for converter grade SCRs and inverter grade SCRs?

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

(a) Show that reverse recovery time and peak inverse current of a power diode are dependent upon storage charge and rate of change of current. 2½+2½=5

(b) Explain the switching performance of BJT with relevant waveforms. Indicate clearly turn-on and turn-off times and their components. 2½+2½=5

(c) What are the different methods to turn on thyristor? Describe any two methods of turn-on mechanism of SCR. 1+2+2=5

(d) What is IGBT? What are its other names? Give it basic structure and working. 1+1+3=5

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

(a) Explain the constructional details and switching characteristics of power MOSFET. 2+4=6

(b) Draw and explain the single phase half controlled converter operation with RL load and derive the average and rms value of output voltage. 2+4=6

(c) Draw a circuit diagram illustrating the protection of both anode and gate circuits of an SCR. Describe briefly the function of any two components used. 2+2+2=6

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SH-V/Electronics-503DSE-1(PR)/19

B.Sc. 5th Semester (Honours) Practical Examination, 2019

ELECTRONICS

Course ID : 51726 **Course Code : SH/ELC/503/DSE-1 (P)**

Course Title : Power Electronics

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.

Answer any one of the followings.

1. Perform an experiment to study the V-I characteristics of DIAC.

2. Perform an experiment to obtain the V-I characteristics of TRIAC and determine breakover voltage and latching current.

3. Perform an experiment to study the V-I characteristics of SCR and determine breakover voltage and latching current.

4. Perform and experiment to obtain the V-I characteristics of MOSFET.

5. Perform an experiment to obtain the V-I characteristics of IGBT.

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SH-V/Electronics-504DSE-2(T)/19

B.Sc. 5th Semester (Honours) Examination, 2019

ELECTRONICS

Course ID : 51717 **Course Code : SH/ELC/504/DSE-2(T)**

Course Title : Transmission lines, Antenna and wave propagation etc.

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 questions: 1×3=3

(a) What are the primary line constants in relation to the transmission line?

(b) What is skin depth?

(c) Define the terms TE. wave and TM-wave in relation to propagation of e.m. wave through wave guides.

(d) What is 'plasma frequency' in connection with the propagation of radio wave through ionosphere?

(e) What is ionosphere? Why is it formed at a certain height in the earth atmosphere?

(f) Mention two application of RADAR.

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

(a) What is Maximum Usable Frequency (MUF)?

(b) What is "duct propagation"? Where does it happen?

(c) What is 'Critical Frequency" in short wave propagation?

(d) Define "skip distance' in connection with ionosphere wave propagation.

(e) What is the function of 'Duplexer' circuit in RADAR system?

(f) The amount of radiated power in a RADAR system is increased by a factor of 4 (four). What will be the new range of the RADAR system then?

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

(a) Derive an expression for the "input impedance" of any high frequency transmission line in terms of secondary line constants.

(b) Show that the "phase velocity" of a plane e.m. wave propagation in an ionized medium is greater than the velocity of light in free space.

(c) Discuss briefly the mechanism of reflection of e.m. wave in ionosphere.

(d) Define VSWR (Voltage Standing Wave Ratio) in connection with the propagation of electrical energy through transmission line. How is it related with the voltage reflection co-efficient?

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

(a) What are primary line constants of a transmission line? Derive the expression of characteristic impedance (Z_0) and propagation co-efficient (P) in terms of primary line constant.

(b) Derive an expression for RADAR range equation for a pulse RADAR system.

(c) Derive the necessary working formula to show how refractive index (μ) of any ionosphere layer is related with the concentration of the free electron (electron density) of that layer.

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SH-V/Electronics-504/DSE-2(PR)/19

B.Sc. 5th Semester (Honours) Practical Examination, 2019

ELECTRONICS

Course ID : 51727 **Course Code : SH/ELC/504/DSE-2(P)**

Course Title : Transmission lines, Antenna and wave propagation

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. A lossless transmission line is 80 cm long and operates at a frequency of 600 MHz. The line parameters are L = 0·25μH/m and C = 100 pF/m. Find the characteristic impedance, phase constant and phase velocity. Verify your answer using MATLAB/SCILSB.

2. The parameters of certain transmission line operating at 6×10^8 rad/s are L = 0·35μH/m, C = 40pF/m, G = 75 μS/m and R = 17Ω/m. Calculate $\lambda, \alpha, \beta, \gamma$ and Z_0. Verify your answer using MATLAB/SCILAB.

3. Express (i) $\vec{E} = 10\sin(\omega t - kz)a_x + 20\cos(\omega t - kz)\,a_y$ and

(ii) $\vec{E} = 100\cos(10^8 t - 0{\cdot}5z + 30°)$,

(iii) $v(t) = 100\cos(l2\pi t - 45°)$

(iv) $v(t) = \cos(l20\pi t - 60°) - \sin(l20\pi t)$ as a phasor. Verify your answer using MATLAB/SCILAB.

4. Two voltage waves having equal frequencies and amplitudes propagate in opposite directions on a lossless transmission line. Determine the total voltage as a function of time and position.

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SH-V/Electronics-501C-11(T)/19

B.Sc. 5th Semester (Honours) Examination, 2019

ELECTRONICS

Course ID : 51711 **Course Code : SH/ELC/501/C-11(T)**

Course Title : Microprocessor and Microcontrollers

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) Give the power supply and clock frequency of 8085 μp.

(b) What is the use of ALE signal?

(c) What is T-state?

(d) What is meant by Microcontroller?

(e) Name special purpose registers of 8085 μp.

(f) Why data bus is bidirectional?

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

(a) Define instruction cycle and machine cycle.

(b) What are the differences between microprocessor and microcontroller?

(c) State the significance of X_1 and X_2 pins of 8085 μp.

(d) Define stack and stack pointer.

(e) What is meant by vectored and Non-vectored interrupts?

(f) Give one example each of 1-byte, 2-byte and 3-byte instruction.

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

(a) Draw the pin diagram of 8085 μp. Explain the function of HOLD and READY signals.

(b) Draw and explain the timing diagram of memory read cycle.

(c) What are software interrupts? Mention the instructions, their hex codes and the corresponding vector addresses. 2+3=5

(d) Draw and label the flags in the flag register in 8085 μp. Briefly explain them.

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

(a) Write an assembly language program with comment lines. An 8-bit number is stored in memory location C1OOH. Count number of ones (i.e. 1's) in this byte and store this count in memory location C2OOH.

(b) Explain the following instructions with suitable example of each:

(i) LXI (ii) MOV (iii) SHLD (iv) LDAX (v) CMP (vi) STA.

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