

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 3rd Year 1st Term Examination, 2015
 Department of Electronics and Communication Engineering

ECE 3101
 (Industrial Electronics)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What is power electronics? Why the study of power electronics is necessary for the students of ECE department? (10)
- b) What do you mean by $\frac{di}{dt}$ protection and $\frac{dv}{dt}$ protection of a thyristor? (10)
- c) Explain the operation of a SCR. (07)
- d) In which method, you can "switch off" a SCR? Explain using necessary diagrams. (08)

2. a) What are the different operating modes of a DC chopper? Explain the operation and mathematical model of a step up chopper. (20)
- b) The buck-boost regulator in fig 2(b) has an input voltage of $V_s=12V$. The duty cycle, $K=0.25$ and the switching frequency is 25 KHz . The inductance $L=150\ \mu H$ and filter capacitance is $C=220\ \mu F$. The average load current $I_a=1.25\text{ A}$. Determine (i) the average output voltage, V_a , (ii) the peak-to-peak output voltage ripple ΔV_c , (iii) the peak-to-peak ripple current of inductor ΔI , and (iv) the peak current of the transistor, I_p . (15)

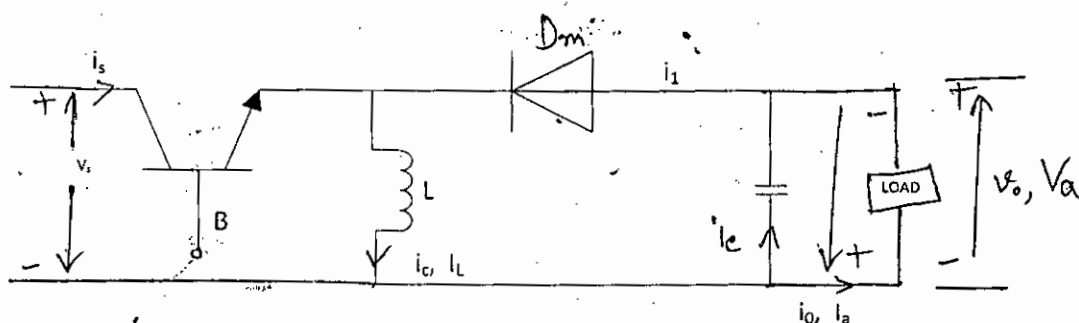


Figure 2(b)

3. a) Illustrate 1- ϕ full converter with circuit diagram, waveforms of the output voltage. Also, evaluate harmonic factor, displacement factor and power factor of this converter. (assume delay factor $\alpha = \frac{\pi}{3}$). (20)
- b) The 1- ϕ half-bridge inverter in figure 3(b) has a resistive load of $R=2.4\ \Omega$ and the dc input voltage is $V_s=48V$. Determine (i) the rms output voltage at the fundamental frequency V_1 (ii) the output power P_o , (iii) the average and peak currents of each transistor, (iv) the peak reverse blocking voltage V_{BR} of each transistor (v) the total harmonic factor and distortion factor. (15)

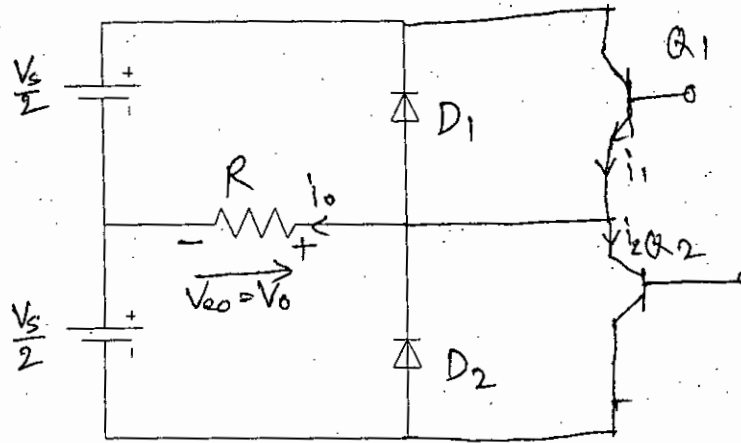


Figure 3(b)

4. a) Describe the principle of a single phase full wave bridge inverter. (10)
- b) Briefly explain the operation of buck regulators with necessary diagrams. (10)
- c) How skin effect becomes responsible for the induction heating? (05)
- d) A slab of insulating material 0.015 m^2 in area, 0.01 m in thickness having relative permittivity of 5, and power factor of 0.05, is to be heated by dielectric heating. The power required at 30 MHz is 400 W . Determine the voltage required and the resulting current that will flow through the material. (10)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Write down the function of free wheeling diode. (06)
- b) Describe the method of speed control of a separately excited dc motor by a single phase semiconverter with necessary diagrams. (10)
- c) Define the following terms in case of performance parameters of dc drives. (12)
 - (i) RMS motor armature current
 - (ii) Input displacement factor
 - (iii) Peak motor armature current
 - (iv) Harmonic factor
- d) Note down the applications of $3-\phi$ drives. Also classify $3-\phi$ drives. (07)
6. a) Derive the equation of minimum braking speed for the case of regenerative break control of dc-dc converter drives. (10)
- b) Draw the necessary waveforms for speed control of a dc motor by a $3-\phi$ full converter system for $\alpha = \frac{\pi}{3}$. (15)
- c) Draw the diagram of open loop control of dc motor for torque disturbance input. (10)
7. a) Write down the applications of induction motor drives. (05)
- b) Draw and describe different regions of torque-speed characteristics curve of induction motor. (10)
- c) Briefly explain static Kramer drive and static Scherbius drive. (10)
- d) Describe Volts/Hertz speed control method of induction motor. (10)
8. a) Classify synchronous motor drives. (07)
- b) Draw the block diagram of vector control method of induction motor. (07)
- c) Write down the effect of saliency for salient pole motors (07)
- d) Write down the uses of permanent magnet motor drives. (07)
- e) Write short notes on stepper motor control mechanism. (07)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2015

Department of Electronics and Communication Engineering

ECE 3103

(Microprocessor & Microcomputers)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Table of MOD and R/M bit patterns for 8086 instructions will be supplied if necessary.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Use a stack map to show the effect of each of the following instructions of Fig. 1(a), (13)
on the stack pointer (SP) and on the contents of the stack. What effect would it have
on the execution of this program if the POPF instruction in the procedure was
accidentally left out?

```
MOV SP, 4000H
PUSH AX
CALL MULTO
POP AX
MULTO PROC NEAR
PUSHF
PUSH BX
PUSH CX
.
.
POP CX
POP BX
POPF
RET
MULTO ENDP
```

Fig. 1(a) Program segment to show the effect on stack and stack pointer.

- b) Suppose that DS=0200 H, BX=0300 H, SI=0100 H, and DI=0400 H. determine the (10)
memory address accessed by each of the following instructions, assuming real mode
operation:
i) MOV DX, [BX+DI], ii) MOV AL, [1234H], iii) MOV AX, [BX],
iv) MOV [DI+100H], AX, v) MOV AX, [BX+SI+100H]
Also mention the corresponding addressing modes for each instruction.
- c) What determines whether a microprocessor is considered a 8-bit, a 16-bit, or a 32-bit (05)
device?
- d) What is pipelining? What are the advantages of using the Queue in Intel 8086 (07)
microprocessor?
2. a) What do you understand by interrupt pointer and type of interrupt? Discuss briefly (12)
about five reserved interrupts of Intel 8086 microprocessor.
- b) Construct the binary code for each of the following 8086 instructions. (08)
i) MOV DX, 4527H [BX], ii) MOV [BX][SI], DX, iii) MOV CX, 43H [BX], iv)
MOV CL, [BX].
- c) Draw the timing diagram for memory read bud cycle of 8086 for the minimum mode (10)
of operation.
- d) Explain the importance of tri state devices in microprocessor. (05)

3. a) Define Opcode, Operand, assembly language, and machine language. Identify Opcode and Operands of the following 8085 instructions. Also mention the number of bytes for each instruction. (10)
i) CMA, ii) LDA 2050H, iii) HLT, iv) DAD H, ORI 0FH.
- b) Define the T-state, Machine cycle, and Instruction cycle. For the instruction MVI A, 32H calculate the time required to execute the Opcode Fetch and memory Read cycles and entire Instruction cycle if the clock frequency is 2 MHz. (10)
- c) What are the differences between Dynamic RAM and Static RAM. (05)
- d) Explain the memory address range of 8K byte memory. If the last memory address is FFFFH, find the starting address. (10)
4. a) Explain the 8086 segment register. Explain the PUSH and POP instruction. (09)
- b) Write down the differences between the following instructions: i) AND and TEST, ii) JUMP and LOOP. Iii) MOV and PUSH. (10)
- c) Draw the interfacing diagram of 4K×16 EPROM (2716) and 2K×16 Static ROM (2114) in an 8086 minimum mode operation. Show the memory map of addresses of the two memories. (10)
- d) Differentiate between compiler and interpreter. (06)

SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) How many operational modes are used in 8255A? Explain Mode 1 with necessary diagram. (10)
- b) What is INTE? Explain the handshake signals for an input port in Mode 1. (10)
- c) What is DMA? Explain DMA controller execution modes. (08)
- d) Explain the interfacing diagram of Intel 8237 with the 8086 microprocessor. (07)
6. a) What do we need to cascade interrupt controllers? Draw the block diagram and explain the major blocks of Intel 8259. (12)
- b) What is the function of co-processor? Explain the 8087 control and status word formats. (10)
- c) What is BSR mode? Construct the control word to initialize the 8255A where the ports; A as an input in mode 1, B as an output in mode 0, C_L as input and C_U as output. (06)
- d) Write short note on Pentium processor. (07)
7. a) What is the function of a programmable timer? Describe different operating modes of Intel 8254. (09)
- b) What is RISC and CISC? Explain the features of RISC and CISC. (10)
- c) For an 8086 microprocessor, write an assembly language program to transfer 16 bytes of data from one memory location to another memory location. (08)
- d) What do you mean by the assembler directives? What are the limitations of high level language? (08)
8. a) Compare the basic features of Intel 80186, 80286, 80386, and Intel 80486. (12)
- b) Describe how an assembly language program is developed and debugged using system tools such as editors, assemblers, linkers, locators, emulators, and debuggers. (11)
- c) What do you understand by embedded system? Is microprocessor an embedded system? (05)
- d) Draw and describe the block diagram of 8051 microcontroller core. (07)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 3rd Year 1st Term Examination, 2015
 Department of Electronics and Communication Engineering
 ECE-3105
 (Microwave Engineering)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Smith Chart will be supplied if necessary.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) How does a transmission line differ from an ordinary electric network? (05)
 b) Starting from an equivalent circuit of a transmission line, deduce time-harmonic transmission line equations. And hence point out the phenomena of solving unknown of that equations. (13)
 c) Obtain the secondary parameters of the transmission line in case of: i) lossless line, (13)
 ii) low-loss line and iii) distortion less line.
 d) Discuss how standing wave occurs in a line. (04)

2. a) What is characteristics impedance? Show that the characteristics impedance of the transmission line is given by $Z_o = \frac{R + j\omega L}{r} = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$ (08)
 b) "An infinite line is equivalent to a finite line, terminated in its characteristics impedance"- explain the statement. (06)
 c) Prove that, input impedance, (13)

$$Z_i = Z_o \frac{Z_L + Z_o \tanh \gamma l}{Z_o + Z_L \tanh \gamma l} \quad (\Omega)$$

 d) For the problem 2(c), assume $Z_o = R_o$, then draw the input reactance curves for i) open, and ii) short circuited line. (08)

3. a) Define quarter-wave line. What is the principle of quarter-wave transformer for acting as matching device of a line? (08)
 b) Explain why short circuited stubs are usually preferred over an open circuited stub. (05)
 c) Discuss the salient features of r -circles and x -circles. (07)
 d) For the Fig. shown below (Fig. 3(d)), find d and l in order to match the line. Use Smith chart for the required solution. (15)

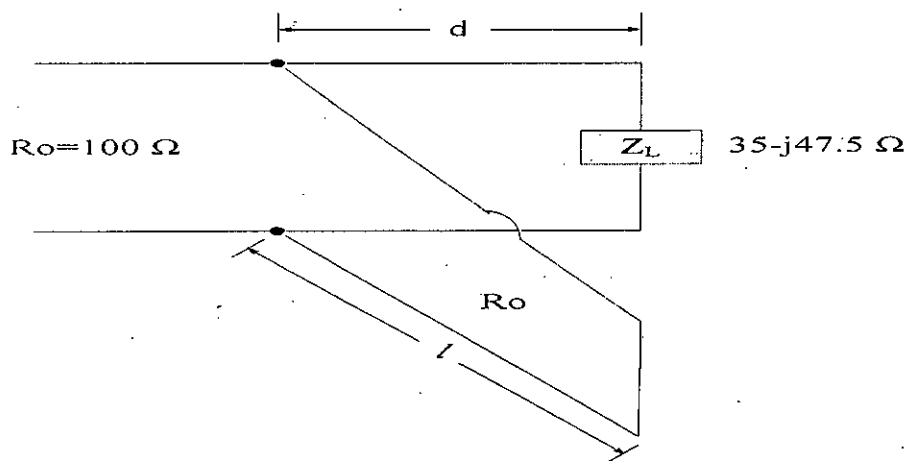


Fig. 3(d)

4. a) Classify the propagating waves in a uniform waveguide. Explain briefly. (06)
- b) Define the following terms: i) dominant mode, ii) cut-off frequency, iii) evanescent mode/wave, and iv) Z_{TEM} , Z_{TE} , Z_{TM} . (08)
- c) Find the dominant mode for the parallel plate waveguide characterized by TM waves. (13)
- d) Consider a length of air-filled copper X-band waveguide with dimensions $a=2.286\text{cm}$, $b=1.016\text{ cm}$. i) Find the cut-off frequencies of the first four propagating modes. ii) What is the propagation constant for the dominant mode? (08)

SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) Classify O-types and M-types tube. (08)
- b) "Conventional electronic vacuum tube fails to operate above the frequency 1 GHz"- justify the statement. (07)
- c) What is beam loading? (07)
- d) Describe the mechanism of operation of reflex klystron oscillator. (13)
6. a) Draw the circuit diagram of two cavity klystron amplifier and its applegate diagram (10)
- b) Describe the analytical description of TWTA. (12)
- c) A helix travelling wave tube operates at 4 GHz under a beam voltage 10 kV and beam current 500 mA. If the helix impedance is $25\ \Omega$ and interaction length is 20 cm, find the output power gain in dB. (08)
- d) Write down the application of BWO. (05)
7. a) Classify the magnetron tube and write down its application. (08)
- b) Find the expression of cut-off voltage and cut-off magnetic field of magnetron. (15)
- c) A pulsed cylindrical magnetron is operated with the following parameters: (12)
- Anode voltage=25 kV
Beam current=25 A
Magnetic density= $0.34\ \text{Wb/m}^2$
Radius of cathode cylinder=5 cm
Radius of anode cylinder=10 cm
- Calculate i) angular frequency, ii) the cut-off voltage, and ii) the cut-off magnetic flux density.
8. a) Write down the important factors of microwave semiconductor devices. Why solid state devices have replaced electron beam devices. (07)
- b) Describe the tunnel diode with its suitable diagram. (12)
- c) What are the adverse effects of high power microwave diode? How can we protect ourselves from electromagnetic radiation hazards? (08)
- d) Write down the name of industrial applications of microwaves. Draw the diagram of microwave oven. (08)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2015
Department of Electronics and Communication Engineering
HUM 3109
(Government and Sociology)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define politics. Why politics is important to study for the students of engineering? (15)
b) What are the relationship between politics and economics? (10)
c) What is state? What are the differences between state and Government? (10)
2. a) Critically discuss the theory of divine origin of the state. (10)
b) What do you mean by public opinion? Discuss the importance of public opinion in a democratic state. (15)
c) Explain that, "Fascism is not based on doctrine but reality." (10)
3. a) Explain the precondition of a successful democratic state. (10)
b) Dictatorship is not substitute for democracy. Discuss this in the light of the merits of democracy. (10)
c) What is parliamentary and presidential form of government? Discuss the differences between parliamentary and presidential form of government. (15)
4. a) Discuss the organization, power and functions of General Assembly. What are the defects of UNO? (20)
b) What is constitution? What are the main characteristics of Bangladesh constitution? (15)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What is Sociology? Explain the importance of studying Sociology for the Engineering students. (10)
b) What is society? Explain different types of society with their distinctive character. (15)
c) Why one human society stratified? (10)
6. a) What is culture? How can you differentiate civilization from culture? (10)
b) What are the bases of human behavior? (10)
c) What is "Cultural Lag"? Explain the carriers of culture. (15)
7. a) What is Industrialization? (05)
b) Explain what is urban living? Explain the empirical consequences of urban living? (10)
c) Where does sub-cultural view and compositional model differ from Louis Wirth's explanation of "Urbanism"? (20)
8. a) What is crime and what are the types of crime? Explain. (10)
b) What do you mean by scientific study of population? What are the elements and factors of population? (15)
c) Explain the "Demographic Transition" theory of population. (10)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2015
Department of Electronics & Communication Engineering
ECE 3109
(Numerical Analysis)

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What are the causes of numerical instability? How can these instability problem be overcome? (10)
b) Write the procedure and limitations of Newton Raphson method. (08)
c) Find the root of the following equation using bisection method $x^3 - x - 3 = 0$. (17)

2. a) What is interpolation? Given a set of $n+1$ points, state the general form of n^{th} degree Lagrange interpolation polynomial. (15)
b) Find the Lagrange interpolation polynomial which agrees with the following data: (10)

x	1.0	1.1	1.2
cosx	0.5403	0.4536	0.3624

Use it to estimate $\cos(1.15)$.

- c) Fit a second order polynomial to the data in the table below: (10)

x	1	2	3	4
y	6	11	18	27

3. a) Write the importance of curve fitting technique. Also, mention the differences between interpolation and regression. (09)
b) Fit quadratic splines to the data given below and predict $f(2.5)$ (18)

x	1	2	3
f(x)	1	1	2

- c) What is Romberg integration? How does it improve the accuracy of integration? (08)

4. a) What is the difference between cubic splines and cubic B-splines? (05)
b) Estimate the value of $\ln(3.5)$ using Newton-Gregory forward difference formula given the following data: (20)

x	1.0	2.0	3.0	4.0
ln	0.0	0.6931	1.0986	1.3863

- c) Estimate the following integrals by Simpson's 1/3 method using the given n : (10)

$$\int_1^2 \frac{dx}{x}, n=2, 4, 8.$$

SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) How does pivoting improve accuracy to solution? (07)
 b) Solve the following system using Dolittle LU decomposition method. (14)

$$\begin{aligned} 2x_1 + x_2 + x_3 &= 5 \\ 3x_1 + 5x_2 + 2x_3 &= 15 \\ 2x_1 + x_2 + 4x_3 &= 8 \end{aligned}$$

- c) Obtain the system of equations of the following circuit in terms of loop currents and find them using Gauss elimination method with partial pivoting. (14)

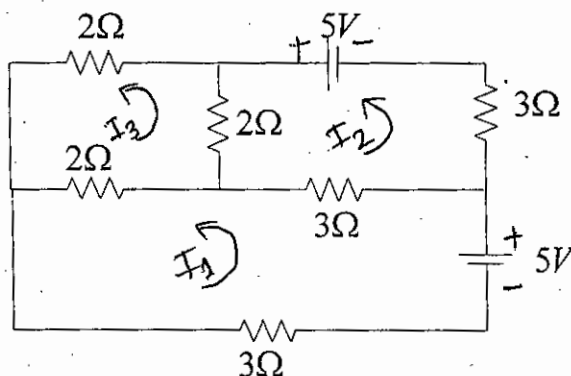


Figure of Q5.(c)

6. a) "Gauss-Seidel method is an improved version of Jacobi iteration method"-Explain and proof the statement using suitable examples. (12)
 b) What is relaxation parameter? Describe the importance of it in iterative solutions of system of equations. (08)
 c) What is the numerical differentiation? Describe the effect of step size 'h' on (i) truncation error, (ii) round off error and (iii) total error in computing numerical differentiation. (08)
 d) The following data are the velocity of an object at different time instant. (07)

T (sec)	1	1.2	1.6	1.8	2.2	2.4	2.8	3.0
v (m/sec)	9.0	9.5	10.2	11.0	13.2	14.7	18.7	22.0

Find the acceleration at T=2.0 sec.

7. a) Why do you need to use numerical computing techniques to solve differential equations? (08)
 b) Why the polygon method is called the midpoint method? Illustrate graphically. (07)
 c) What is an initial-value problem? How is it different from a boundary-value problem? (05)
 d) Solve the differential equation $y' = 2xy$ with $y(0)=1$ to estimate $y(1)$ using Milne-Simpson method. Use RK method to calculate the starting values and choose the step size $h=0.25$. (15)
8. a) What are the eigen value problems? Explain the steps of power method to find the dominant eigen value. (08)
 b) What is Poission's equation? How does it differ from Laplace equation? (05)
 c) Describe the usefulness of Bender-Schmidt method in solving heat equation. (10)
 d) Solve the wave equation $f_{tt}(x,t) = 4f_{xx}(x,t)$, $0 \leq x \leq 5$ with boundary conditions $f(0,t)=0$ and $f(5,t)=0$ and initial values $f(x,0)=f(x)=x(5-x)$
 $f_t(x,0)=g(x)=0$. (12)