KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2017

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) Draw the characteristic curve of an SCR and explain its operation. (12)
   b) Why Germanium is not chosen for controlled rectifier? (05)
   c) Write down the pros and cons of $\frac{di}{dt}$ effect and $\frac{dv}{dt}$ effect (06)
   d) How does an UJT operates as a relaxation oscillator? Explain. (12)

2. a) What do you mean by GTO? What are the advantages of a GTO over BJT and SCR? (06)
   b) How a DIAC can operate as a bidirectional device? Why it is used for triggering? (09)
   c) Describe the various triggering modes of Triac. (11)
   d) The UJT relaxation oscillator of Fig. 2(d) is required to be designed for triggering an SCR. The UJT has the following data: R_{BB}=4.5kΩ, η= 0.7, V_p=17.5v, I_p=0.7mA, V_v=1.2v, I_v=3mA. Normal leakage current with emitter open= 4mA. Calculate the values of R, R_1 and R_2 (Neglect V_D) for the firing frequency 2.5kHz and capacitance C= 0.05μF. (09)

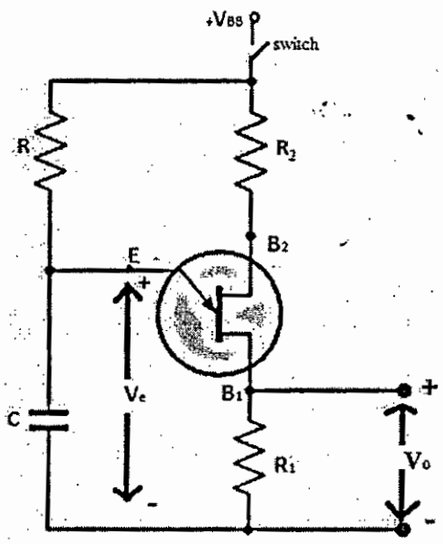

Fig. 2(d)

3. a) What be the importance(s) of 3 – ϕ inverters? Explain the operation of a 3 – ϕ inverter by employing (20)
   i) schematic block diagram
   ii) circuit diagram, and
   iii) Waveforms for 120° conduction.

b) A 3 – ϕ inverter (conventional) has a Y-connected resistive load of R= 5Ω and L=23mH. The inverter frequency is f_0=60Hz and the dc input voltage is V_s=220v. Express (a) the instantaneous line-to-line voltage $v_{ab}(t)$ and line current $i_a(t)$ in a Fourier series, (b) the total harmonic distortion (THD) and the distortion factor (DF) and (c) the THD and DF of the lowest order harmonic. (1..

4. a) Classify choppers depending on the direction of current and voltage flows. Explain with different circuit diagrams, (20)

b) The buck-boost regulator in Fig. 4(b) has an input voltage V_s= 12v. The duty cycle, k=0.25, and the switching frequency is 25kHz. The inductance, L= 150μH and filter capacitance, C=220μF. The average load current I_a= 1.25A. Determine (i) the average output voltage, V_a, (ii) the peak- to-peak output ripple voltage ΔV_c (iii) the peak- to-peak ripple current of inductor ΔI, and (iv) the peak current of the transistor, I_p. (15)

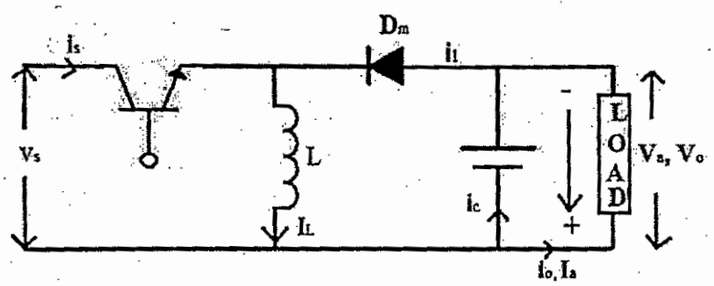

Fig. 4(b)

SECTION B

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

5. a) What is the purpose of a converter and free wheeling diode in dc drives? (06)

b) With the help of necessary diagrams, describe the operating modes of dc motor drives for variable speed applications. (12)

c) What are the merits and drawbacks of variable speed dc drives relative to ac drives? (05)

d) A 120-hp 600v 1200-rpm dc series motor controls a load requiring a torque of 200N.m at 1000rpm. The field circuit resistance 0.06Ω, the armature circuit resistance 0.04Ω and the voltage constant k_v=0.0321v/A-rad/s. The viscous friction and no load losses are negligible. The armature current is continuous and ripple free. Calculate: i) The back EMF, ii) The required armature voltage, iii) The rated armature current. (12)

6. a) Explain the operation of single phase semi-converter drive for dc motor and also draw the waveforms of typical voltages and currents. (11)

b) For a single phase full-converter drive of dc motor prove that the average output voltage is same as the supply voltage. (12)

c) Draw the block diagram and explain the operation of an open-loop block diagram of separately excited dc motor. (12)

7. a) Explain the principle of rheostatic braking of a dc chopper-fed dc motor drives. (08)

b) Draw the necessary waveforms for speed control of a dc motor by a three phase semiconductor system for the firing angle, α=90°. (10)

c) The speed of a 20hp 300v 900rpm separately excited dc motor is controlled by a three phase full converter. The field circuit is also controlled by a three phase full converter. The ac input to the armature and field converter is three phase, wye-connected, 208v, 60Hz. The armature resistance is 0.25Ω, the field circuit resistance is145Ω and the motor voltage constant is 1.2v/A-rad/s. The viscous friction and no load can be considered negligible. The armature and field currents are continuous and ripple free. If the free converter is operated at the maximum field current and the developed torque is T_d=116N.m at 900rpm, determine delay angle of the armature converter. (12)

d) What is a static Kramer drives? (05)

a) Explain the torque-speed characteristics of induction motors. (10)

b) Describe the principle of salient-pole synchronous motor. (08)

c) How does Rotor voltage control method vary the speed and torque of induction motors? (08)

d) A dc separately excited motor is powered by a dc chopper as shown in Fig. 8(d) from a 600v dc source. The armature resistance R_a=0.05Ω. The back emf constant of motor is k_v=1.527v/A-rad/s. The average armature current is I_a=250A. The field current is I_f=2.5A. The armature current is continuous and has negligible ripple. If the duty cycle of the chopper is 60%, determine, i) The input power from the source; ii) The motor speed and iii) The developed torque. (09)

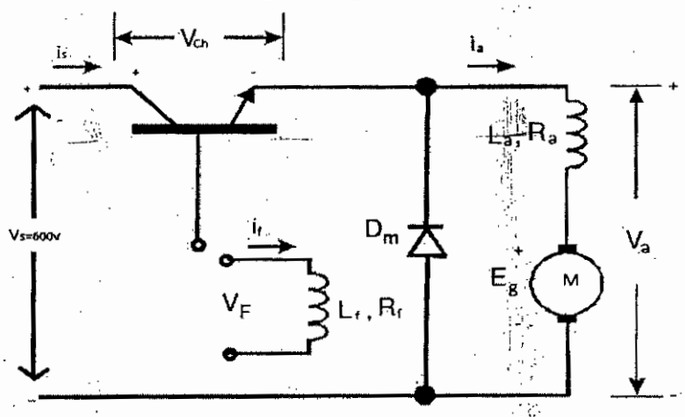

Fig. 8(d)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year1st Term Examination, 2017

Department of Electronics and Communication Engineering

ECE 3103

(Microprocessors & 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 will be supplied if necessary.

SECTION A

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

1. a) Briefly explain the important signals of Intel 8086. Explain instruction prefix LOCK, and signal $\overline{LOCK}$. (10)

b) Discuss the functions of i) Segment register ii) Instruction pointer and iii) Stack pointer. (09)

c) Show the results that will be in the affected registers or memory locations after the execution of following group of instructions. Assume that each group of instructions starts with the register contents shown in Fig. 1(c). (10)

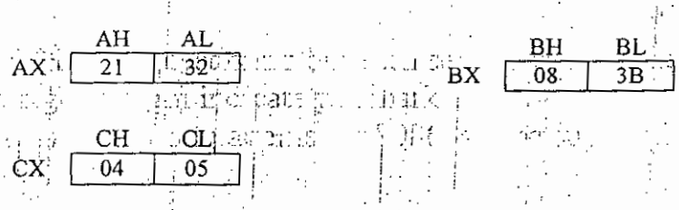

Fig. 1(c)

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MOV BX, 101AH
MOV AL, [BX]
SUB AL, CL
INC BX
MOV [BX], AL
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d) Write the 8086 instruction which will perform the indicated operation. (06)
i) Copy AH to a memory location whose offset is in BX.
ii) Multiply AL times BL.
iii) Add 07H to DL.

2. a) Describe the function of EQU, DB, DW and DD Directives. (08)

b) Construct the binary codes for each of the following 8086 instructions using templates of Fig. 2(b). (06)
i) MOV CX, [246BH] ii) AND AL, OFH iii) ADD AX, BX

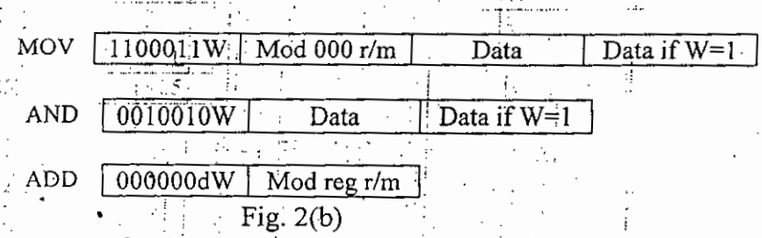

Fig. 2(b)

c) Describe the purpose of using system tools of i) Assemblers, ii) Debuggers, and iii) Linkers (09)

d) Write down the machine code for each of the following 8086 instructions. (12)
i) MOV SP, BX ii) MOV CX, 43H[BX], iii) MOV CX, [437AH] iv) MOV CL, [BX]

3. a) Classify interrupt in 8086 microprocessor. Discuss briefly five reserved interrupts of Intel 8086 microprocessor. (10)

b) What are the corresponding math coprocessor instructions to calculate the following mathematical operations? (06)
i) $y \log_2 x$ ii) $\log_{10} 2$ iii)$\sin \theta$

c) Convert $(-96.27)_{10}$ to IEEE single precision and double precision floating point formats. (10)

d) Mention the role of READY, $MN/\overline{MX}$, ALE, and $\overline{DEN}$ pins of Intel 8086. (09)

4. a) Why writing and using procedures is necessary? Discuss the role of PUSH and POP instructions. (11)

b) Describe the different data types in 8087. (06)

c) How the execution of math instruction of Intel 80486 has been 3 times faster as compared to an 80386 microprocessor and 80387 co-processor combinations? Explain it. (07)

d) Draw the internal configuration of Direct Memory Access (DMA) controller and describe its different data transfer modes. (11)

SECTION B

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

5. a) Define microprocessor. Write down the limitation of 8085 microprocessor as an MPU. (08)

b) Draw and describe the block diagram of 8051 microcontroller core. (12)

c) What are the types of buses present in a microprocessor? How are these buses organized in an 8085 microprocessor? (10)

d) What do you mean by tri-state devices? If the memory chip size is 1024×4 bits, how many chips are required to make up 4K bytes of memory? (05)

6. a) What are the differences between RISC and CISC processor? Is Intel 8085 a CISC processor? Justify your answer. (08)

b) Illustrate the bus timing diagram to execute the machine code MVI A, 32H, where the hex code for MVI A is 3EH. The memory locations where the codes stored, are 2000H and 2001H. (07)

c) What are the programmable and nonprogrammable ports? Draw the block diagram of Intel 8255 and discuss the main features of it. (07)

d) Briefly explain the handshake signals in Intel 8255, which are used in its Mode 1 and Mode 2 operations. Also explain how the control word for bit set/reset of port C of Intel 8255 is determined. (08)

e) Write short notes on Pentium processor. (05)

7. a) Draw the block diagram of programmable counter Intel 8254. Also with approximate timing diagram describe the operating modes of Intel 8254. (14)

b) Explain the functions of the 8259A interrupt controller. (07)

c) How cascading is performed in 8259? Briefly explain the function of IRR, ISR and IMR in 8259. (09)

d) Discuss the counter latch command and read-back command in Intel 8254. (05)

8. a) 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. (13)

b) What is the purpose of priority resolver in intel 8259? (07)

c) Briefly explain the following priority modes of Intel 8259: i) Fully Nested Mode, ii) Automatic Rotation Mode, and iii) Specific Rotation Mode. (10)

d) What are transputers? What are the disadvantages of bus architecture of a computer? (05)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2017

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) Necessary chart that will be provided is Smith chart

SECTION A

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

1. a) Starting from the equivalent circuit of a transmission line, deduce time harmonic transmission line equations and also point out the wave characteristics on an infinite transmission line. (10)

b) "When a finite transmission line is terminated with its own characteristic impedance, the voltage and current distribution on the line are exactly the same as though the line has been extended to infinity"-Justify the statement. (13)

c) Explain low loss line and distortion less line. (06)

d) What do you mean by standing wave and how is it occurs in a line? (06)

2. a) The open circuit and short circuit impedances measured at the input terminals of a lossless transmission line of length 1.5(m), which is less than a quarter wavelength, are –j54.6(Ω) and j103(Ω), respectively. (09)

(i) Find Z_0 and γ of the line.

(ii) Without changing the operating frequency, find the input impedance of a short circuited line that is twice the given length.

(iii) How long should the short circuited line be in order for it to appear as an open circuit at the input terminals.

b) What is a quarter-wave transformer? Why is it not useful for matching a complex load impedance to a low-loss line? (06)

c) A lossless line of characteristic impedance $R_0 = 50\Omega$ is to be matched to a load $Z_L = 50 \Big/ \left[2 + j\left(2+\sqrt{3}\right)\right]^{\Omega}$ by means of a lossless short circuited stub. The characteristic impedance of the stub is 100Ω. Find the stub position (closest to the load) and length so that a match is obtained. Use Smith chart for the solution. (15)

d) What is a Smith chart and why is it useful in making transmission line calculation? (05)

3. a) If "T" represents transmission coefficient and "Γ" represents reflection coefficient then prove that, $T = 1 + \Gamma$ with proper illustration. (10)

b) Derive the expression of cut off frequency of TE_n mode and also find the wave impedance of that mode for parallel plate waveguide. (12)

c) Derive the expression for the transverse field components of TE_{mn} mode of rectangular waveguide and also find the cut off frequency for the dominant mode. (13)

4. a) Find the cut off frequency of the first two propagating modes TE_{11} ($P'_{11} = 1.841$) and TM_{01} ($P_{01} = 2.405$) of Teflon-field circular waveguide with a=0.5 cm. If the interior of the guide is gold plated, calculate the attenuation due to dielectric loss in dB for a 30 cm length operating at 14GHz. Assume $\varepsilon_r = 2.08$ for Teflon and $\tan\delta = 0.0004$. (12)

b) Derive the expression for the transverse filed components of TE_{mn} mode of a circular waveguide. (13)

c) Define Q factor of a cavity resonator. Show that $\frac{1}{Q_l}=\frac{1}{Q_0}+\frac{1}{Q_{ext}}$, where symbols have their usual meaning. (10)

SECTION B

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

5. a) What do you mean by linear beam type tube and crossed field type tube? Classify cross field type tube. (04+04)
   b) What do you mean by beam loading of a tube? (07)
   c) How the bandwidth of a Klystron tube can be improved? Explain with necessary diagram. (07)
   d) Find out the value of beam coupling coefficient, depth of modulation and bunching parameter of reflex klystron oscillator from velocity modulation process. (13)

6. a) Write down the differences between travelling wave tube amplifier and klystron amplifier. (06)
   b) Write down the applications of TWT. (04)
   c) Describe the electron trajectory of magnetron oscillator and find out the value of Hull cut-off magnetic voltage of magnetron oscillator. (05+08)
   d) A TWT operates under the following parameters: beam voltage V_0=3kV, beam current I_0=30 mA, characteristic impedance of helix Z_0=10 ohm, circuit length N=50, frequency f=10GHz. Determine (i) the gain parameter, C (ii) the output power gain, A_p in decibels and (iii) first propagation constant. (12)

7. a) Classify the magnetron tube and write down its applications. (03+05)
   b) Why microwave solid state devices have replaced the electron beam devices? Classify different types of microwave diode with their proper applications. (03+05)
   c) What are meant by power divider and directional coupler? Write down the applications of Gunn diode. (10)
   d) How does the EM radiation cause damage of biological substances? How can we protect ourselves from such radiation hazards? (09)

8. a) Describe the mechanism of microwave heating system. (08)
   b) How can be applied the microwave in medical purposes? (07)
   c) Draw and describe the terrestrial microwave communication system. (05+05)
   d) What is fading? Classify different types of fading. Describe the causes of attenuation for atmospheric multipath fading. (05+05)

KHULNA UNIVERSITY OF ENGINEERING &TECHNOLOGY (KUET)
B.Sc. Engineering 3rd Year 1st Term Examination, 2017
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) What is politics? What are the scopes of politics? (12)
   b) What is state and government? Discuss the elements of the state. (13)
   c) What are the relationship between politics and economics? (10)

2. a) What is democracy? What are the essential conditions for the successful working of a democratic government? Are those conditions available in Bangladesh? Explain. (20)
   b) Critically discuss the theory of divine of origin of the state. (15)

3. a) What do you mean by political party? Discuss how political parties are essential for the successful working of democracy. (15)
   b) What do you mean by public opinion? Discuss the importance of public opinion in a democratic state. (10)
   c) What is Fascism? "Fascism is not based on doctrine but reality"-justify the statement. (10)

4. a) Describe briefly the aim and objectives of UNO. (10)
   b) Discuss the organizations, power and functions of security council of UNO. (15)
   c) What is constitution? What are the main characteristics of Bangladesh constitution? (10)

SECTION B

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

5	a)	Explain that Sociology is the study of human interaction. Why do you study it?	(10)
	b)	What is community and what are the conditions of a community?	(10)
	c)	What is society? Explain different types of society.	(15)
6.	a)	Differentiate between class system and caste system.	(10)
	b)	What is crime? Explain different types of crime.	(10)
	c)	Explain the role of social control to prevent deviant behavior.	(15)
7.	a)	Why is the study of culture important?	(10)
	b)	Explain the bases of human behavior.	(10)
	c)	Explain the carriers of culture.	(15)
8.	a)	What is Industrialization?	(05)
	b)	What is urbanism? Explain Wirth's urban determinism.	(10)
	c)	Explain the empirical consequences of urban living.	(10)
	d)	What is urban process? Explain concentric zone model with example.	(10)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 3rd Year 1st Term Examination, 2017

Department of Electronics and 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) In an iterative process, how does the step size affect the total error? Explain. (08)
   b) Prove that the Newton-Raphson method shows quadratic convergence of the error function. What is the physical significance of this statement for Communication Engineering? (12+5)
   c) The flux equation of an iron core electric circuit is given by (10)
   $$f(\phi) = 10 - 2.1\phi - 0.01\phi^3$$
   The steady state value of the flux is obtained by solving the equation $f(\phi) = 0$. Use a Bisection method to estimate the steady state ϕ.

2. a) What are the differences between interpolation and regression from the Communication Engineering point of view? (10)
   b) What is Minimax approximation? Write down it's properties and application areas. (12)
   c) How does the Newton interpolation formula overcome the limitation of Lagrange formula? Construct the Newton divided difference table and calculate $\sqrt{2.5}$ using the following data : (13)

x	1	2	3	4	5
$\sqrt{x}$	1	1.4142	1.7321	2	2.2361

3. a) What is Cubic splines? Write down the key steps for the derivation of Cubic splines. (03+04)
   b) Show that the linear regression line of y on x passes through the point that represents the mean of x and y values. (13)
   c) Given the table of data (15)

x	1	2	3	4
z	0	1	2	3
y	12	18	24	30

   Obtain a regression plane to fit the data.

4. a) Describe the trapezoidal Method of computing integrals. What is the physical significance of computing integrals for a real-time system? (05+03)
   b) Use Simpson's 3/8 rule to evaluate (12)
   i) $\int_1^2 (X^3 + 1)\ dx$
   ii) $\int_0^{\pi/2} \sqrt{\sin(x)}\ dx$
   c) Compute Romerg estimate R_{22} for $\int_1^2 \frac{1}{x}\ dx$ (15)

SECTION B

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

5. a) What is system of equations? Compare the computational requirements of Gauss Elimination and Gauss Jordan method for solution of system of equations. (09)

   b) Define underdetermined and overdetermined system. Which methods are suitable to solve these systems? (06)

   c) Write down the procedural steps of LU decomposition method along with the LU's element calculation process. (09)

   d) Calculate the loop currents of the following electrical system using Gauss elimination method with partial pivoting. (11)

$$x-3y+z=4$$
$$2x-8y+8z=-2$$
$$-6x+3y-15z=9$$

6. a) Temperature distribution in an IC under specific boundary conditions can be simplified to linear system as: (10)

$$4T_1 + T_2 - T_3 = 3$$
$$2T_1 + 7T_2 + T_3 = 19$$
$$T_1 - 3T_2 + 12T_3 = 31$$

   Find the temperature T_1, T_2 and T_3 using Gauss-Seidel method.

   b) State the formula used in Milne- Simpson method. Describe the implementation scheme of these formula. (12)

   c) Distinguish between ordinary and partial differential equations. (05)

   d) Estimate the first derivative of the following function at x=1 with h=0.01 using three point central difference formula. (08)

$$ln(1+x^2)$$

7. a) Estimate $y(1)$ for the following equation using Runge-Kutta method with h=0.5. (13)

$$y' = y - x^2+1;\ y(0) = 0.5$$

   b) What is the Eigen value problem? Find the largest Eigen value and corresponding vector of the following matrix using power method with an initial guess of $[1\ 1\ 1]^T$. (12)

$$\begin{bmatrix} 0 & 11 & -5 \\ -2 & 17 & -7 \\ -4 & 26 & -10 \end{bmatrix}$$

   c) What is SVD? How can you compute the inverse of a nonsingular matrix? Explain. (10)

8. a) What is Poission equation? Solve the Poission equation over the square domain $0 \le x < 3$ and $0 \le y < 3$ with $f = 0$ on the boundary and $h = 1$. (Only the relationship of unknowns are required, no need to find numerical value) (10)

   b) Solve the wave equation $f_{tt}(x,t)=16f_{xx}(x,t)$, $0 \le x < 5$ with the boundary conditions $f(0,t)=0$ and $f(5,t)=0$ and initial values $f(x,0)=f(x)=x(5-x)$ and $f_t(x,0)=g(x)=0$. (10)

   c) What is FEM? Write down the advantages and applications of FEM. (08)

   d) Explain the procedural steps of FEM in brief. (07)