Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 2nd Year Even Semester Examination, 2019

Department of Electrical & Computer Engineering

Course No: **ECE 2205** Course Title: **Analog Electronic Circuits II**

Marks: **72** Time: **03:00** Hours

N.B. (i) Answer **SIX** questions taking any **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) For the following multistage amplifier as shown in Figure 1(a), draw the ac equivalent circuit and derive the equations to determine the (i) voltage gain, (ii) input impedance , and (iii) output impedance. 08

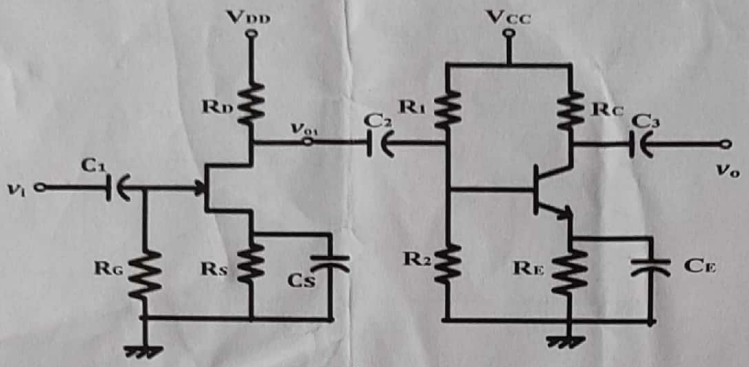


Figure 1(a)

(b) Draw a current mirror circuit using BJT and explain its operation. 04

Q.2(a) Calculate the voltage gain of each stages as well as the overall voltage gain for the amplifier circuit of Figure 2(a). Also, draw the input-output wave shapes in same axis for $v_i = 10\ mV$. 05

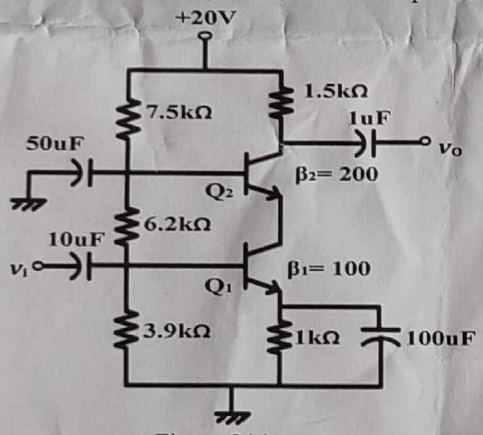


Figure 2(a)

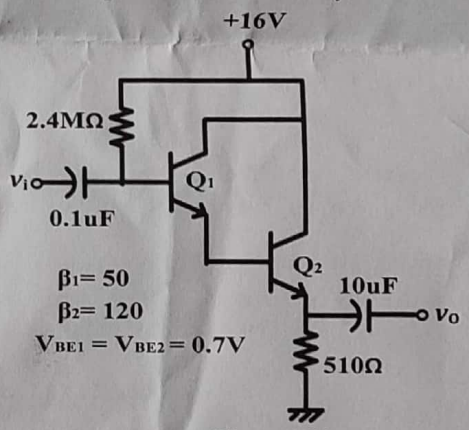


Figure 2(b)

(b) Find the voltage and current gain for the circuit of Figure 2(b). 05

(c) Write short notes on : (i) CMRR (ii) Slew rate 02

Q.3(a) Define Miller effect capacitance and inter-electrode capacitance. Explain the causes of production of these two capacitances. 04

(b) Determine the cutoff frequencies for the network of Figure 3(b). 05

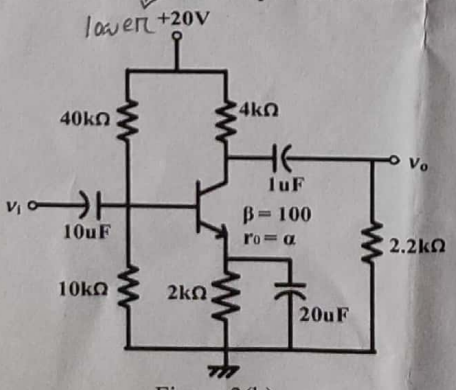


Figure 3(b)

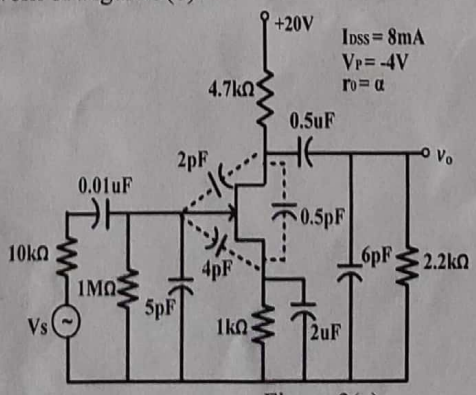


Figure 3(c)

(c) Determine the high cutoff frequencies for the network of Figure 3(c). 03

Q.4 (a) Design a circuit using Op-amps so that the output voltage is given as, $V_o = -5V_1 + 7\frac{dV_2}{dt} + 10\int V_3 dt$; where , V_1, V_2, and V_3 are input voltages. 04

(b) The slew rate of an Op-amp is $0.5\ V/\mu S$. For an inverting amplifier with gain of 10, find the maximum peak-to-peak input signal that can be applied without distorting the output at a frequency of 40kHz. 04

(c) What is false triggering in comparator circuit? How can it be solved? Explain. 04

SECTION-B

Q.5 (a) Show that, Op-amp can be applied to obtain a circuit with the characteristics of negative impedance. 04

(b) Draw a precision rectifier circuit and explain its operation with necessary figures. 04

(c) Determine the voltage gain $A_v = V_o/V_1$ of the network of Figure 5(c). 04

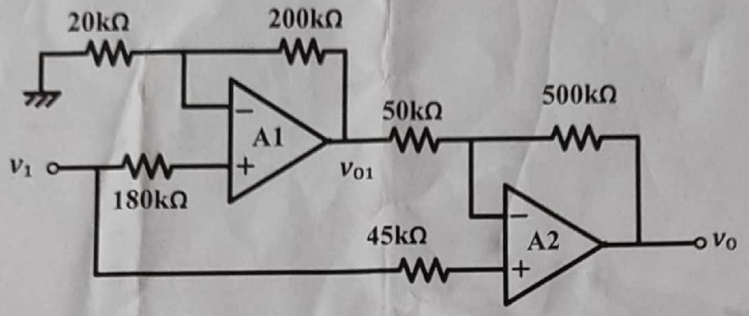


Figure 5(c)

Q.6 (a) Show that, for Colpitts oscillator, the resonant frequency, $f_0 = \frac{1}{2\pi}\frac{\sqrt{C_1+C_2}}{\sqrt{LC_1C_2}}$, where the symbols have their usual meaning. 04

(b) Design an active high pass filter. What is the main disadvantage of this filter? How can we overcome it? 04

(c) Design an active band pass filter which only allows the signals between the frequency range 50 kHz to 100 kHz. 04

Q.7 (a) Draw the internal diagram of timer 555 IC. 03

(b) "Monostable multivibrator can be used as a frequency divider"-justify the statement. 04

(c) Design a square wave generator using timer 555 IC. Assume, $V_{cc} = 12\ V$ and $f_0 = 3.5kHz$. 05

Q.8 (a) How can a 555 IC be used as a frequency shift keying modulator? 04

(b) Prove the Barkhausen criterions for any oscillator circuit. 04

(c) Design a phase shift oscillator of Figure 8(c) so that oscillating frequency is 400Hz. 04

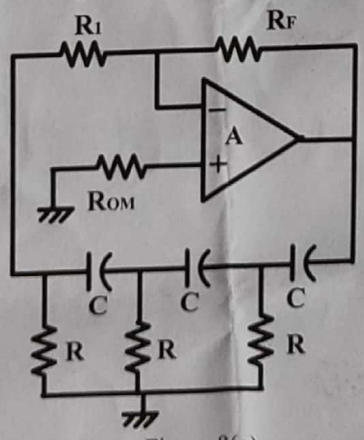


Figure 8(c)

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 2nd Year Even Semester Examination, 2019

Department of Electrical & Computer Engineering

Course No: **Math 2217** Course Title: **Complex Variable, Statistics & Transform Methods**

Marks: **72** Time: **03:00** Hours

N.B. (i) Answer **SIX** questions taking any **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) Interpret geometrically $ze^{i\alpha}$ where α is real and z is complex number. 04

(b) Show that $u = 2x(1-y)$ is a harmonic function and find v such that $f(z) = u + iv$ becomes an analytical function. Also, express f in terms of z. 04

(c) Evaluate $\int_c (x^2 - iy^2)dz$ along the parabola $y = 2x^2$ from (1, 1) to (2, 8). 04

Q.2(a) What is meant by singular point of a function? Explain with examples. 03

(b) State and prove Cauchy's integral formula. 05

(c) Find the value of $\oint_c \frac{(z+4)dz}{z^2+2z+5}$. 04

Q.3(a) Evaluate $\frac{1}{2\pi i}\oint_c \frac{e^{zt}}{(z^2+1)^2}dz$, when $t > 0$ and e is the circle $|z| = 3$. 04

(b) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurent series valid for (i) $|z| > 3$ (ii) $0 < |z+1| < 2$. 04

(c) Evaluate $\int_0^\infty \frac{x \sin x}{(x^2+9)}dx$ using residue theorem. 04

Q.4 (a) Determine Fourier series of 06

$$f(x) = \begin{cases} -2, & when \quad -\pi < x < -\frac{\pi}{2} \\ 2, & when \quad -\frac{\pi}{2} < x < \frac{\pi}{2} \\ -2, & when \quad \frac{\pi}{2} < x < \pi \end{cases}$$

and has a period of 2π. Also, draw the graph of $f(x)$ taking first two harmonic terms.

(b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$; $u(0,t) = u(\pi,t) = 0$, $u(x,0) = 2x$, $0 < x < \pi$, $t > 0$ using Fourier transform. 06

SECTION-B

Q.5 (a) Evaluate (i) $L\{t^2 \cos at\}$, (ii) $L\{t^2 e^{2t} \sin 4t\}$ and, (iii) $L^{-1}\left\{\frac{4s+12}{s^2+8s+16}\right\}$ 06

(b) Solve the differential equation by using Laplace transform 06

$y'' - 3y' + 2y = 4e^{2t}$, $y(0) = -3, y'(0) = 5$

Q.6 (a) State and prove the multiplication law of probability. 06

(b) A symmetric die is thrown 600 times; find the binomial distribution getting 80 to120. 06

Q.7(a) Determine the mean, median and standard deviation of the following distribution: 06

Marks	1-10	11-20	21-30	31-40	41-50	51-60
No. of students	3	16	26	31	16	8

(b) Establish the general relationship between central and raw moments. Hence find the relation between them for particular four moments. 06

Q.8(a) Find the moment generating function, skewness and kurtosis of normal distribution and comment on the shape. 06

(b) The following data related to length of service and income of the employees of an organization: 06

Length of service (years)	11	7	2	5	8	6	10
Income (Tk. hundred)	7	5	3	2	6	4	8

Compute the coefficient of correlation for the data. Also, find the two regression equation for the data.

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 2nd Year Even Semester Examination, 2019

Department of Electrical & Computer Engineering

Course No: **ECE 2215** Course Title: **Database Systems**

Marks: **72** Time: **03:00** Hours

N.B. (i) Answer **SIX** questions taking any **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) Why DBMS is important? What are its advantages? 03

(b) What are entity and entity set? How is a weak entity set handled in DBMS? Explain. 03

(c) Suppose you are recruited as a database specialist by the Rajshahi High-Tech authority to help them design a database for train e-ticketing system efficiently. Now think the regular features and draw an E-R diagram accordingly. 06

Q.2(a) What is data abstraction? Describe the different level of data abstraction. 04

(b) Consider the following relational database. 08

Patient (Patient_ID, Patient_name, Mobile)
History (Patient_ID, Symptom, Date)
Report (Parient_ID, Corona_center, Test_result)

Now write down the relational algebra (Not SQL) to find out the following queries.

(i) Find the names of those patients who have fever symptom.
(ii) Consider that if any patient has high-fever symptom he/she will be suspected as corona patient. Find out such maximum number of patients in a date.
(iii) Find out the mobile numbers of those patients who have provided samples in Rajshahi corona center and their results have become positive.
(iv) Find out the name of those patients who have high fever symptom but test result have become negative.

Q.3(a) What is normalization? Discuss 1NF and 2NF. 04

(b) Explain the consistency property of a database system with a proper example. 03

(c) What is joining? Discuss each type of joining between two data tables with example. 05

Q.4 (a) What is concurrency control? Consider the following two transactions. 07

T1:
read (P);
read (Q);
if P=10 then Q:=Q-5;
write (Q);

T2:
read (Q);
read (P);
if Q=10 then P:=P+5;
write (P);

P Q
5 5
5 5
5 5

Let the consistency requirement be P=5 or Q=5 with P=Q=5 the initial values.

(i) Show a concurrent execution of T1 and T2 that produces a serializable schedule.
(ii) Is there a concurrent execution of T1 and T2 that produces a serializable schedule?

(b) How many ways a DBMS could be failed? What precautions should be taken considering the failure of DBMS and point out the recovery methods. 05

SECTION-B

Q.5 (a) Write a short note on SQL. 02

(b) Consider the following relational database. 08

Patient (Patient_ID, Patient_name, Mobile)
History (Patient_ID, Symptom, Date)
Report (Parient_ID, Corona_center, Test_result)

Now write down the SQL (Not Algebra) to find out the following queries.

(i) Find the names of those patients who have-fever symptom.
(ii) Consider that if any patient has high fever symptom he/she will be suspected as corona patient. Find out such maximum number of patients in a date.
(iii) Find out the mobile numbers of those patients who have provided samples in Rajshahi corona center and their results have become positive.
(iv) Find out the name of those patients who have high fever symptom but test result have become negative.

(c) Write down the SQL queries to create the following tables. 02
Patient (Patient_ID, Patient_name, Mobile)
History (Patient_ID, Symptom, Date)
Report (Parient_ID, Corona_center, Test_result)

Q.6 (a) Consider the following data tables. 06

Student

Roll	Name	Dept	Sub_Code	Sub_Grade	Reg_Sub_Code
1710001	Mr. A	ECE	ECE-2103	A+	ECE-2103 ECE-2107
1710002	Mr. B	ECE	ECE-2107	A	ECE-2103 ECE-2107
1710003	Mr. C	ECE	ECE-2103	A-	ECE-2103
1710004	Mr. D	ECE	ECE-2107	A+	ECE-2107
1710001	Mr. A	ECE	ECE-2107	A-	ECE-2103 ECE-2107
1710002	Mr. B	ECE	ECE-2103	A+	ECE-2103 ECE-2107

Now,
(i) Carefully notice the entries and point out your opinion regarding space efficiency.
(ii) What will happen if you update any particular information?
(iii) What will happen if you are asked to delete 'ECE-2107' from the registered course list preserving all other information?

(b) Discuss the different keys in DBMS. Write down the importance and use of foreign key with example. 06

Q.7(a) Considering the following data tables (Student, GPA, Credits) answer (i), (ii), (iii), & (iv). 12

Student

St_ID	St_Name
2010001	Abdullah
2010002	Ahmad
2010003	Mohammad
2010004	Muaz
2010005	Minhaz

GPA

St_ID	Sub_Code	gpa
2010001	ECE-1103	3.00
2010002	ECE-1107	3.25
2010004	ECE-1103	4.00
2010005	ECE-1103	4.00
2010003	ECE-1107	3.75

Credit

Sub_Code	Credit
ECE-1103	3.00
ECE-1107	3.00

(i) Write down the SQL query to show the list of students who got the lowest gpa.
(ii) Write down the SQL query to find out the registered subjects of those students whose name started with "A".
(iii) Write the SQL query to calculate the cgpa of each student using the formula,

$$cgpa = \frac{\sum gpa * Credit}{\sum Credit}$$

(iv) Generate a list showing each subject code and corresponding highest gpa.

Q.8(a) Discuss about four aggregate functions. 04
(b) Write down two examples of using sub-queries. 04
c) Write short note on the following statements. 04
(i) ON CASCADE DELETE.
(ii) Group By.

sum( ) / sum as cgpa
from cgpa inner join credit on
group by st_id.

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 2nd Year Even Semester Examination, 2019

Department of Electrical & Computer Engineering

Course No: **Hum 2217** Course Title: **Industrial Management & Accountancy**

Marks: **72** Time: **03:00** Hours

N.B. (i) Answer **SIX** questions taking any **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) Define management, efficiency and effectiveness. 03
(b) What is organizing? Discuss its basic elements. 04
(c) What is decision making? State the steps of decision making with example. 05

Q.2(a) What is motivation? Why is it important? 03
(b) Briefly state the Need-Hierarchy theory of motivation with its practical use. 05
(c) What is performance appraisal? Discuss various problems associated with appraising employee performance. 04

Q.3(a) Define EOQ, Reorder point, Lead time and Safety stock. 03
(b) Dell computers company begins a review of ordering policies for its continuous review systems by checking the current policies for a sample of items. Following are the characteristics of one item. Demand is 650 units/week (assume 52 weeks/ year). Ordering and setup costs are USD50000 /order or setup. Holding costs are USD30 /unit/year. Lead time 2 weeks. Standard deviation of weekly demand is 50 units. Cycle service level is 92% (assume corresponding Z-value 1.42). 09

(i) What is EOQ for the item?
(ii) What is Safety stock?
(iii) What is Re-order point?
(iv) If on hand inventory is 400 units, there is an order placed equal to EOQ and there is 200 units backorder. Is it time to place a new order?
(v) Show the cost implication of Q=15,000 units instead of EOQ calculated earlier.
(vi) Show the whole situation on a continuous review chart.

Q.4 (a) What is layout planning? Why is it done? 04
(b) What is line-flow layout? State the process of designing line-flow layout. 05
(c) What performance criteria should be emphasized while designing Plant Layout? 03

SECTION-B

Q.5 (a) What is accounting? State its objectives. 04
(b) What do you mean by double entry system? State the rules for debit and credit. 04
(c) What is transaction? State its characteristics. 04

Q.6 (a) Distinguish between cost accounting and financial accounting. 02
(b) Define direct cost and indirect cost. 02
(c) The following data is related to a manufacturing company of a standard product during the month of January 2021. Raw materials consumed Tk 450,00. Direct wages Tk 300,000. Factory overhead Tk 200,000. Administrative and selling expenses Tk 60,000 and Tk 40,000 respectively. Profit 20% on total cost of goods sold. During the month the company produced 5000 units and sold 4000 units. 08

In February 2021, the company plans to sell 6000 units. Material price and wages rate are expected to increase by 10% and 15%, respectively. 40% of factory overhead is variable. Other cost will remain unchanged. Profit 25% on the total cost of goods sold.

Prepare a statement of cost in respect of the above data and show (i) prime cost (ii) cost of goods sold (iii) net profit and (iv) sale price per unit.

Q.7(a) What do you understand by BEP? Give an example. 03
(b) What is meant by contribution margin? How is it ascertained? 03
(c) Alfa Ltd. produces and sales electronics goods. The products are sold Tk 250 per unit. Variable costs are Tk 150 per unit and fixed cost total Tk 200,000. 06

Required:

(i) Compute the companies CM and CM Ratio.
(ii) Calculate the companies BEP.
(iii) How many units will have to be sold to earn a profit of Tk 200,000.

(iv) What would be the profit if sales are 5000 units.
(v) Draw a break even chart and show the BEP.

Q.8 From the following Trial Balance of M/S Anik Electronic Limited prepare a Trading Account and Profit & Loss Account for the year end 31st December 2019, and a Balance Sheet as on that date: 12

Dr. Trial Balance Cr.

Particulars	Amount (Tk)	Particulars	Amount (Tk)
Salaries	25,000	Loan from Bank	100,000
Purchases	190,000	S/ Creditors	80,000
Wages	35,000	Sales	460,000
Buildings	200,000	Discount	10,000
Machineries	150,000	Return out	10,000
Furniture	100,000	Capital	400,000
Cash at Bank	40,000		
Carriage in	15,000		
S/ Debtors	40,000		
Rent	10,000		
Import duty	20,000		
Investment	170,000		
Bad debts	5,000		
Insurance	15,000		
Stationary	5,000		
General expenses	20,000		
Interest	5,000		
Return in	10,000		
Advertisement	5,000		
Total	**1,060,000**	**Total**	**1,060,000**

Adjustments:
(i) Closing stock was valued at Tk 145,000.
(ii) Salaries outstanding Tk 5,000 and general expenses prepaid Tk 10,000.
(iii) Stationary unused Tk 1,000.
(iv) Depreciate furniture by 20% and machineries by 10%.

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 2nd Year Even Semester Examination, 2019

Department of Electrical & Computer Engineering

Course No: **ECE 2213** Course Title: **Numerical Methods**

Full Marks: **72** Time: **03:00** Hours

N.B. (i) Answer **SIX** questions taking any **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) Define numerical method. How does it become popular? Why do ECE engineers require numerical methods? 04

(b) What are the errors involved in numerical methods? How do they enter into the process? Give example. 04

(c) What are the error representations? Two PT-voltmeter arrangements give 999V and 9999V instead of 1kV and 10kV. Obtain error by all possible error representations. Hence comment on error strength of the readings. 04

Q.2(a) What is meant by iterative method? Write the names of iterative methods to solve nonlinear equations. Write the generalized steps to solve the nonlinear equations using iterative methods. 04

(b) Compute current, I from the following power balance equation obtained from an electric circuit by using an iterative method. 04

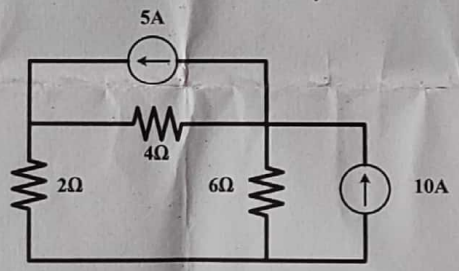
$$5I^2 + 50I = 1000$$

(c) Write the steps of N-R method. Discuss its merits and demerits. 04

Q.3(a) Discuss Gauss Elimination method to solve linear simultaneous algebraic equations. 04

(b) Discuss partial and complete pivoting in brief. 04

(c) Obtain the nodal equations from the following circuit. Hence solve for the unknowns using Gauss-Seidel iterative method. Show two iterations only. 04



Q.4 (a) What is curve fitting? Why is it required for ECE engineers? Discuss least square technique condition. 04

(b) A robot arm with a rapid laser scanner is doing a quick quality check on holes drilled in a 15"×10" rectangular plate. The centers of the holes in the plate describe the path the arm needs to take, and the hole centers are located on a Cartesian coordinate system (with the origin at the bottom left corner of the plate) given by the specifications in the table below. 06

x(in.)	2	4.25	5.25	7.81	9.20	10.60
y(in.)	7.2	7.1	6.0	5.0	3.5	5.0

If the leaser is traversing from x=2 to x=4.25 to x=5.25 in a quadratic path, what is the value of the y at x=4.00 using a curve fitting technique.

(c) Deduce the linear regression expression. 02

SECTION-B

Q.5 (a) Define interpolation and extrapolation. List two general techniques of curve fitting. 03

(b) To verify Ohm's law, an experiment was performed and the results obtained are in the following table. 05

V(volt)	5	10	15	20	25
I(amps)	1	2.1	3	4.2	5

Use linear interpolation to determine the current for 12V of supply. Explain why the result differs from actual value.

(c) Using Newton's general interpolation formula find f(x) as a polynomial in x for the following table. 04

x	-1	0	3	6	7
f(x)	3	-6	39	822	1611

Also, determine f(3.5) using the polynomial.

Q.6 (a) What is the basis of numerical differentiation? Write at least four difference equations to obtain numerical differentiation. 04

(b) A 1 Henry inductance gets current through it at different times as follows. Obtain the voltage across it at t=0.27 sec using numerical differentiation. 05

t_{sec}	0.25	0.26	0.27	0.28	0.29
I_{amp}	0.2474	0.2571	0.2667	0.2764	0.2860

(c) Discuss trapezoidal rule of numerical integration. 03

Q.7(a) Derive Simpson's one-third rule and hence show that the rule is exact up to degree three. 04

(b) Evaluate, $\int_1^2 (x^2+1)dx$ using Simpson's 3/8 rule. 04

(c) Discuss Euler's method to solve ordinary differential equations. 04

Q.8(a) Give, $\frac{dy}{dx} = x^2 + y^2$ where y=0 when x=0. Find y(0.4) assuming h=0.2. 06

(b) Solve the Laplace's equation for the square region shown in the following figure, the boundary values being indicated in the figure. 06