

University of Dhaka
 Department of Computer Science
 First Year 1st Semester 2013-14 Second In-course Examination
 Course No. MATH-1124 Calculus Marks: 30

Answer any 5 questions. All questions are of equal value. Time: 1 (One) hour.

- 1. (a)** State Taylor's series. Use Taylor's series to expand $f(x) = \frac{1}{x+2}$ in powers of $(x-3)$.
(b) State Mean Value theorem and verify for the function $f(x) = 3 + 2x - x^2$ in the interval $[0, 1]$.
- 2. (a)** Let $f(x) = x^3 - 3x^2 + 1$. Find the intervals where $f(x)$ is increasing, decreasing. Also find the local extrema of $f(x)$.
(b) Show that $f(x) = \frac{x}{\ln x}$ has a minimum value which is e .

3. Evaluate the following integrals:

$$(i) \int \frac{x^2}{x^2 - 4} dx \quad (ii) \int \frac{dx}{(1+x^2)\sqrt{\tan^{-1}x+3}} \quad (iii) \int \frac{\cos x - \sin x}{\sqrt{1-\sin 2x}} dx \quad (iv) \int \frac{e^x}{e^{2x} + 2e^x + 5} dx$$

4. Compute the value of the following integrals:

$$(i) \int_0^{\pi} \frac{\sin x}{1+\cos x} dx \quad (ii) \int_0^1 \tan^{-1} x dx \quad (iii) \int_0^{\log 2} \frac{e^x}{e^x + 1} dx \quad (iv) \int_0^a \frac{dx}{\sqrt{ax-x^2}}$$

5. (a) Define Gamma and Beta functions. Prove that $\Gamma(n+1) = n\Gamma(n)$ and hence find $\frac{\Gamma(5/2)}{\Gamma(1/2)}$.
(b) Evaluate the following:

$$(i) \int_0^{\infty} x^2 e^{-2x^2} dx \quad (ii) \int_0^{\pi/2} \sin^5 x \cos^6 x dx$$

6. (a) If $I_n = \int_0^{\pi/4} \tan^n \theta d\theta$, then show that $n(I_{n+1} + I_{n-1}) = 1$.

(b) Evaluate $\lim_{n \rightarrow \infty} \left[\frac{n^2}{(2n+3)^3} + \frac{n^2}{(2n+6)^3} + \frac{n^2}{(2n+9)^3} + \dots + \frac{n^2}{(5n)^3} \right]$.

Department of Computer Science & Engineering, Dhaka University

Second In-Course Examination

Ist Year Ist Semester B.Sc. (Honors), Session: 2013-2014

EEE - 1121, Electrical Circuit Analysis

Total Marks: 35

Time: 1 Hour

1. a) In what network arrangements, multiple voltage sources or current sources cannot appear in a series-parallel network? Explain based on their characteristics. 4
- b) How you can make a choice of mesh analysis or nodal analysis or both observing the network arrangement? Explain. 4
2. a) For the following network in Figure: 1, find V_1 , V_2 and I_2 . 4

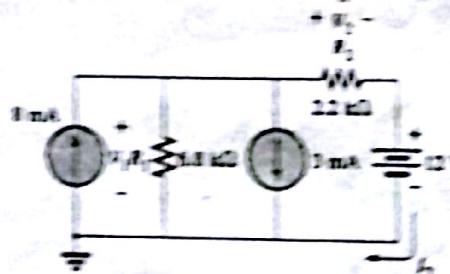


Figure: 1

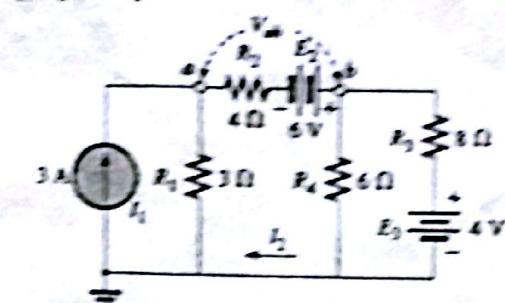


Figure: 2

- b) For the above network in Figure 2, find V_m and I_d using mesh and nodal analysis. Make necessary conversions to the network for analyzing and check your results. 7
- c) Find the current I for the following network in Figure: 3. 3

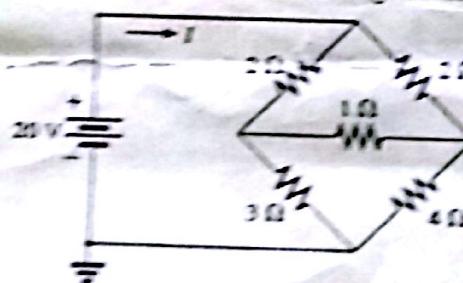


Figure: 3

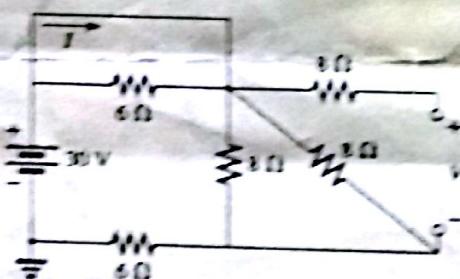


Figure: 4

3. a) Determine the voltage V and the current I for the above network in Figure 4. 4
- b) For the following network in Figure 5, determine the currents I_1 , I_2 , I_3 and voltage levels V_a and V_b . 5

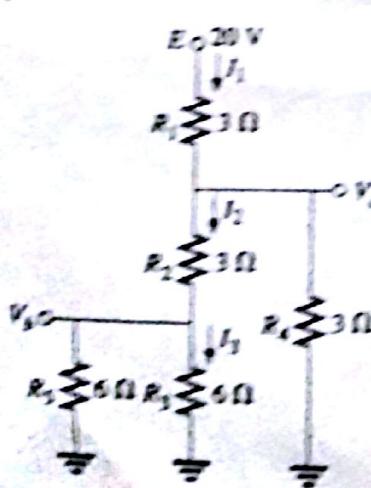


Figure: 5

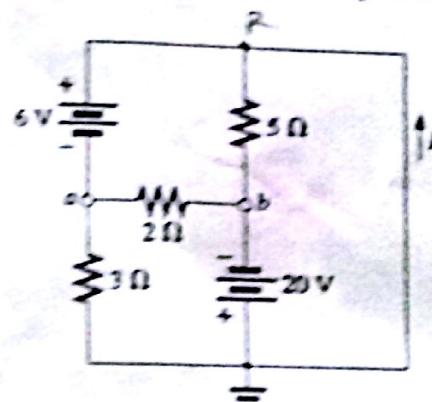


Figure: 6

- c) For the above network in Figure 6, calculate voltage V_m and current I . 4

University of Dhaka
 Department of Computer Science
 First Year 1st Semester 2013-14 First Incourse Examination
 Course No. MATH-1124 Calculus Marks: 30

Answer any 4 questions. All questions are of equal value. Time: 1 (One) hour.

1. (a) Define function. What do you mean by domain and range of a function? Sketch and find the domain and range of the following functions:

(i) $f(x) = \frac{x}{|x|}$ (ii) $f(x) = \sqrt{x-3}$

(b) If $f(x) = \begin{cases} 1+x, & x > 0 \\ 1-x, & x \leq 0 \end{cases}$ does $f'(0)$ exist?

2. (a) Find the differential coefficients of the following functions:

(i) $y = x^{\tan^{-1} x} + (\sin x) \log x$ (ii) $y = \frac{3at^2}{1+t^3}$, $x = \frac{3at}{1+t^3}$ (iii) $y = \sin(e^x) \log x$

- (b) If $y = e^{a \sin^{-1} x}$, then show that,

$$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0.$$

3. (a) Evaluate the following limits:

(i) $\lim_{x \rightarrow 2} \frac{x^3 + 3x^2 - 12x + 4}{x^3 - 4x}$

(ii) $Lt_{x \rightarrow 0} \frac{\cos 2x - 1}{\cos x - 1}$

- (b) State L' Hospitals rules. Apply this rule to evaluate

(i) $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$ (ii) $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x^2 \sin x}$

4. Test the continuity and differentiability of a function $f(x)$ at a point $x = 1$, where

$$f(x) = |x| + |x-1|.$$

5. (a) Differentiate $\tan^{-1} \frac{x}{\sqrt{1-x^2}}$ with respect to $\sec^{-1} \frac{1}{2x^2-1}$.

- (b) A 5 ft ladder, leaning against a wall, slips in such a way that its base is moving away from the wall at a rate of 2 ft/sec at the instant when the base is 4 ft away from the wall. How fast is the top of the ladder moving down the wall at the instant?

University of Dhaka
Department of Computer Science and Engineering
First Year First Semester B.Sc. Final Examination, 2014
CSE-1101 : Computer Fundamentals

Total Marks: 60

Time: 2.5 Hours

[Answer any Four (4) of the following Questions]

- | | | |
|----|--|-----|
| 1. | a) Mention the features of the 4 th generation computers. Why are the modern computers digital? | 3 |
| | b) Describe the six logical units of a computer. | 3 |
| | c) Define bus. Mention the types of buses. | 2 |
| | d) What are the advantages of RISC architecture over CISC architecture? | 3 |
| | e) Explain the steps of information processing cycle. | 4 |
| 2. | a) Describe working principle of a laser printer. | 4 |
| | b) Distinguish between a LCD monitor and a LED monitor. | 3 |
| | c) What happens when a key of a keyboard is pressed? | 3 |
| | d) What are the advantages of an optical mouse? | 3 |
| | e) Write a short note on digital camera. | 2.5 |
| | | 2.5 |
| 3. | a) Distinguish between EPROM and EEPROM. | 2 |
| | b) Write down the properties of DRAM. | 3 |
| | c) How data can be read from an optical disk? | 3 |
| | d) Distinguish between a CD and a DVD. | 3 |
| | e) Describe the structure of a hard disk and a hard disk drive. | 4 |
| 4. | a) Describe the types of system software. | 4 |
| | b) Mention the utility programs. | 3 |
| | c) Distinguish between machine language and high level language. | 2.5 |
| | d) Mention the properties of Linux | 2.5 |
| | e) Define ASCII code and Unicode. Mention the advantages of Unicode over ASCII code. | 3 |
| 5. | a) Write down the ten commandments defined by the computer ethics institute. | 5 |
| | b) Define network topology. Mention the main features of ring topology. | 3 |
| | c) Distinguish between guided and unguided transmission media. | 3 |
| | d) Mention the function of a bridge? What is a modem? | 2 |
| | e) Define network protocol. What is meant by SNMP? | 2 |
| 6. | a) It is said that open source software is more secured. Is it safe? Explain. | 3 |
| | b) How can we keep a computer virus free? | 3 |
| | c) How can we maintain network security? | 3 |
| | d) Define Virus, Trojan Horse and Worm. | 3 |
| | e) Describe the components of a CPU. | 3 |

Set B (1st year 2014, CT-2, CSE 1101, Time: 1 hour, Marks: 20)

- | | |
|---|-----|
| 1. Mention features of Ring topology. | 3 |
| 2. Distinguish between coaxial cable and optical fibers. | 3 |
| 3. What is meant by IP? Why do we use it? | 2 |
| 4. Distinguish between hard disk and DVD. | 2 |
| 5. Describe structure of a magnetic disk. | 3.5 |
| 6. Write down the properties of Microsoft Windows NT. | 2 |
| 7. Mention the utility programs. | 3 |
| 8. Mention the difference between compiler and interpreter. | 1.5 |

**Department of Computer Science and Engineering
First Year First Semester B.Sc. Final Examination, 2014
EEE-1121 : Electrical Circuit Analysis**

Total Marks: 60

Time: 2.5 Hours

[Answer any Four (4) of the following Questions]

1. a) How do you define a relationship between Ohm's Law and equation of a straight line? 4
 b) Find the unknown currents in the following network in Fig. 1.1. 4

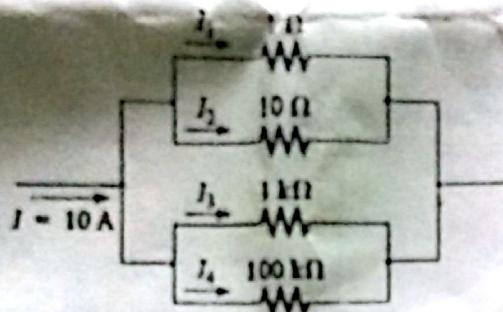


Fig. 1.1

- c) What is the resistance of a 100-ft long copper wire with a diameter of 0.020 inch at 20°C? 3
 d) Briefly describe the affects of temperature on conductor, semiconductor and insulator. 4

2. a) Using Kirchhoff's voltage law, find the unknown voltages for the configurations in Fig. 2.1. 3

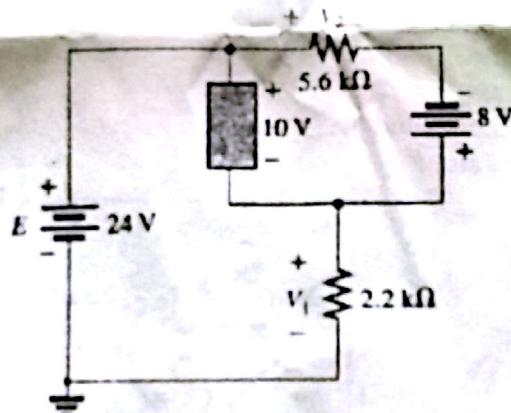


Fig. 2.1

- b) Referring to Fig 2.2 3

- i) Determine V_2 and V_3
 ii) Determine R_3

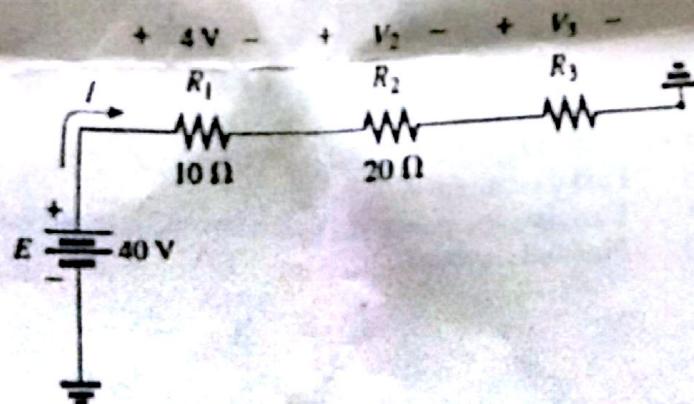


Fig. 2.2

- c) What is voltmeter's loading effect? 2
 d) Briefly explain open and short circuits.

(c) Determine the values of R_1 , R_2 , R_3 , and R_4 for the voltage divider of Fig. 2.3

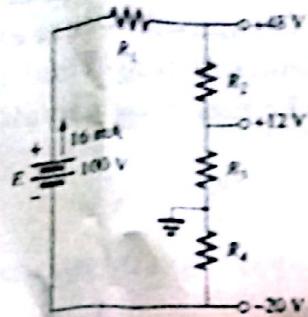


Fig. 2.3

3. a) For the network in Fig. 3.1:

- Determine voltages V_A , V_B , and V_C .
- Find current I_2 .
- Find the source current I_{S1} .

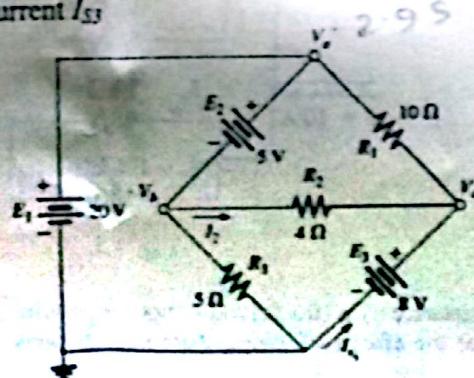


Fig. 3.1

b) Determine the dc levels for the transistor network of following Fig. 3.2 using the fact that $V_{BE} = 0.7\text{ V}$, $V_E = 2\text{ V}$, and $I_C = I_E$. That is:

- Determine I_E and I_C .
- Calculate I_B .
- Determine V_B and V_C .
- Find V_{CE} and V_{AC} .

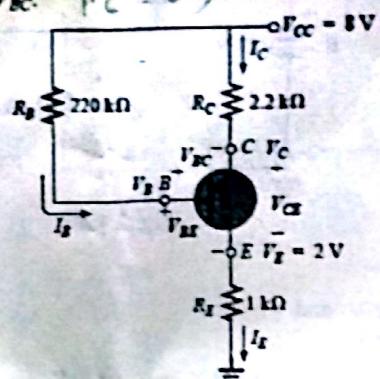


Fig. 3.2

c) For the network in Fig. 3.3:

- Find the current I_1 .
- Calculate the power dissipated by the 4Ω resistor.
- Find the current I_2 .

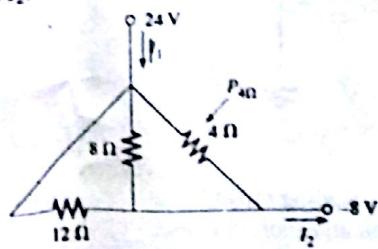


Fig. 3.3

a) For the following network in Fig. 4.1, find the branch currents using:

10

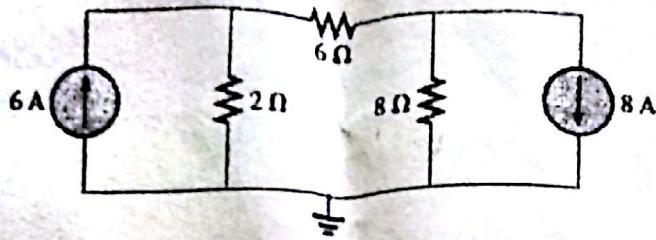


Fig. 4.1

- i) Supermesh approach
- ii) Source conversion
- iii) Nodal analysis
- iv) Superposition theorem

b) Consider the following network in Fig 4.2.

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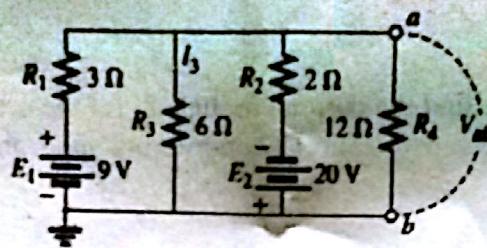


Fig. 4.2

- i) Find the voltage V_{ab} and the polarity of points a and b .
- ii) Find the magnitude and direction of the current I_3 .

5. a) For the networks in Fig. 5.1, write the nodal equations and solve for the nodal voltages.

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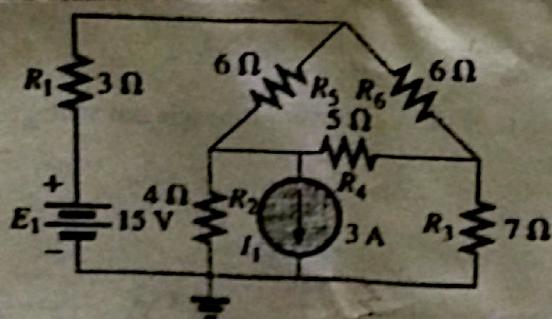


Fig. 5.1

b) Using a Δ - Y or Y - Δ conversion, find the current I in each of the networks in Fig. 5.2.

4

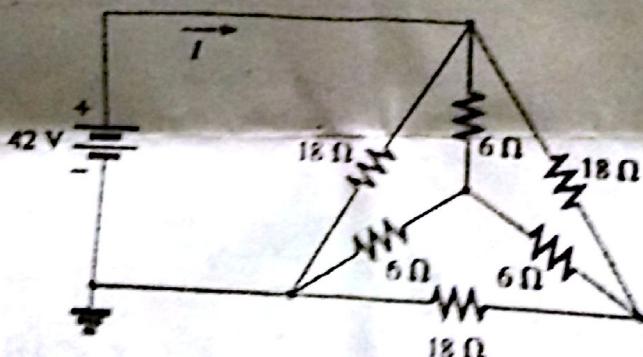


Fig. 5.2

- c) State Thévenin's theorem with example. Find the Thévenin equivalent circuit for the portions of the networks in Fig. 5.3 external to points *a* and *b*. 2+4

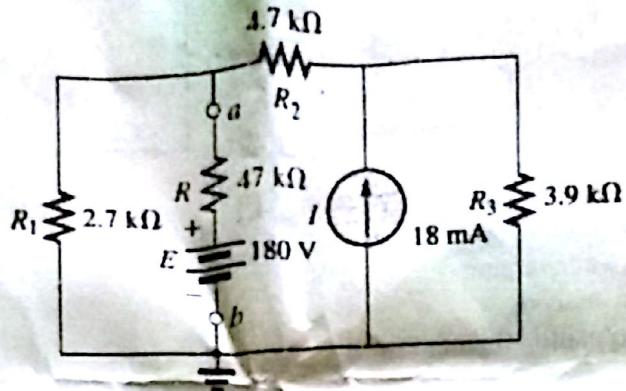


Fig. 5.2

6. a) i) Using superposition, find the current through R_1 for the network in Fig. 6.1
ii) Demonstrate that the superposition theorem is not applicable to power levels. 3+2

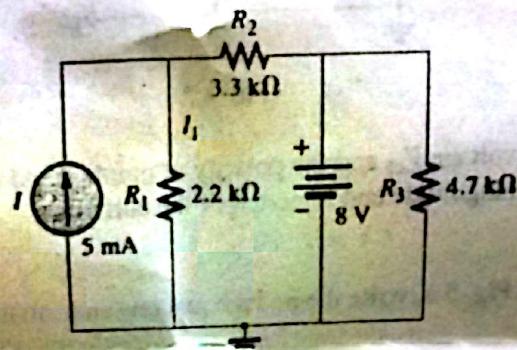


Fig. 6.1

- b) State substitution theorem. Find the current through and voltage across the resistor R_L in Fig. 6.2. 2+3

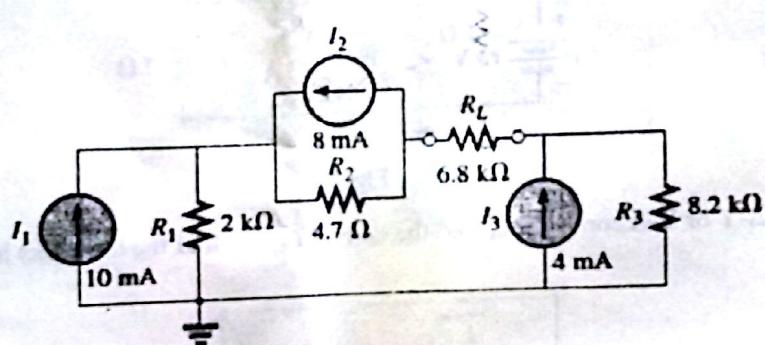


Fig. 6.2

- c) What is the limitation of reciprocity theorem? Prove the reciprocity theorem for the network in Fig. 6.3. 1+4

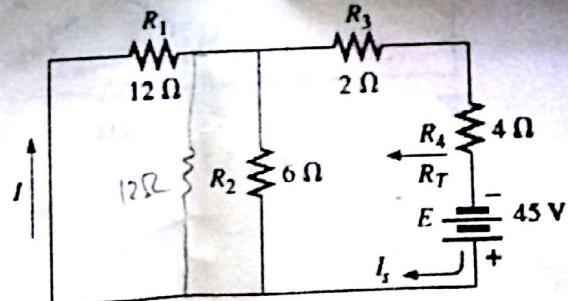


Fig. 6.3

University of Dhaka
Department of Computer Science and Engineering
First Year First Semester B.Sc. Final Examination, 2014
CHM-1123 : Chemistry

Total Marks: 60

Time: 2.5 Hours

[Answer any Four (4) of the following Questions]

1. a) Classify thermodynamic processes and chemical reaction according to heat change. 3
 b) State the laws of thermodynamics and their implications. 3
 c) Derive an equation to find the effect of temperature on the heat of reaction. 5
 d) One mole of nitrogen is heated from 0 °C to 10 °C under a pressure of 2 atm. Calculate the change in enthalpy assuming the mean specific heat at constant pressure is 0.244 Cal deg⁻¹ gm⁻¹. 4

2. a) For a gaseous reaction the heats of reaction at constant pressure and at constant volume may be different, why? 3
 b) The heat of formation of the following compounds from their elements are – PbO = -50,300 Cal; SO₂ = -70,920 Cal; PbS = 19,300 Cal. For the reaction PbS + 1.5 O₂ = PbO + SO₂, Find the heat of reaction at constant volume and constant pressure. 4
 c) Explain the followings: 4
 - i) Heat of combustion ii) Heat of dilution
 - iii) Hess's law iv) Heat of sublimation
 d) Calculate the heat of formation of CS₂ given that the heats of combustion of CS₂, S and C are -265.10 K Cal; -70.96 K Cal and -94.3 K. Cal respectively. 4

3. a) State law of mass action and explain it with a suitable example. 2
 b) Derive the relationship between K_p and K_c . In what situation K_p will be equal to K_c ? 4
 c) Mention the optimum condition for ammonia synthesis. Justify your answer with reference to Le Chatelier Principle. 5
 d) The partial pressures of N₂O₄ and NO₂ in an equilibrium mixture of two gases at 25 °C are 0.69 atm and 0.31 atm respectively. Calculate (a) the K_p and (b) the degree of dissociation of N₂O₄. 4

4. a) Define electrochemical and electrolytic cells with examples and their applications/uses. 4
 b) What is standard electrode potential? How would you determine this? Show the necessary arrangements for this experiment. 4
 c) Define primary and secondary cells with examples. Show the construction and chemical changes occurring in a lead-acetate storage cell. 4
 d) Calculate the potential at 25 °C of the cell Sn/Sn²⁺(0.1M) || Fe³⁺(0.3)/Fe. 3

5. a) Explain the following terms: 3
 - i) Rate of reaction ii) Order of a reaction
 b) Describe a method to determine the order of a reaction. Under what conditions a bimolecular reaction becomes a monomolecular one? 3+3
 c) For a certain first order reaction $t_{1/2}$ is 100 sec. How long will it take for the reaction to be 75% completed? 2
 d) Show the energy level diagram for exothermic and endothermic reaction. Ans 3 4

6. a) What is Arrhenius concept of acid-base? 2
 b) Classify the followings as acid or base giving reasons: H⁺, AlCl₃, Co, NH₃, CaO, Cl₂. 3
 c) What do you mean by P^H scale? Describe a method for the determination of P^H of a solution. 1+3
 d) How do you make a choice of a suitable indicator for acid-base titration? 4
 e) How does an acid-base indicator work? 2