(2½ Hours)  
(Total Marks: 60)

Please check whether you have got the right question paper.

N.B.:  
1) All questions are compulsory.  
2) Figures to the right indicate full marks.

1. a) Answer any TWO of the following:
   i) Explain the mechanism of a reaction involving carbene as an intermediate. (04)
   ii) Justify the following:
       I) Reaction of 2-bromopropionic acid with dilute alkali results in the
       formation of product with retention of configuration. (04)
       II) The rate of acetylation of trans-2-iodocyclohexylbromosylate is much
       faster than the acelolysis of its cis-isomer. (04)
   iii) Discuss the role of FMO in reactions involving hard and soft nucleophiles
       and electrophiles. (04)
   iv) Draw the molecular orbitals of 1,3,5-hexatriene and comment upon their
       symmetry properties. (04)

   b) Answer any ONE of the following:
   i) Explain molecular orbital basis for the α-effect. (04)
   ii) Give any two methods of generations of ketenes. How do ketenes react with
       acetic acid and ammonia? (04)

2. a) Answer any TWO of the following:
   i) Explain Diels-Alder Reaction. What are the effects of substituents on the
      reaction. (04)
   ii) Using correlation diagram, explain whether ring closing reaction of 1,3-
      butadiene can take place thermally or photochemically. (04)
   iii) Give the synthesis of Vitamin-D from 7-dehydrocholesterol. (04)
   iv) What are cheletropic reactions? Explain giving examples. (04)

   b) Answer any ONE of the following:
   i) Give an account of claisen rearrangement. (04)
   ii) What are ene reactions? Explain with examples. (04)

3. a) Answer any TWO of the following:
   i) Assign the point groups to the following molecules:
      Chloroform, Benzene, Spiro [3.3] heptane and Ferrocene. (04)
   ii) Discuss the conformational features of cyclodecane ring system. (04)
   iii) Draw all the possible planar and three dimensional structures of
        diasterisomers of perhydroanthracenes. (04)
   iv) Explain – Substituted cyclohexanes with axial –OH group undergoes
       oxidation at a faster rate than the equatorial isomer. (04)

   b) Answer any ONE of the following:
   i) Discuss transannular reactions giving examples. (04)
   ii) Explain the structural features of cis and trans-hydrindanes. (04)
4. a) Answer any TWO of the following:
   i) Draw and explain Jablonski diagram.  (04)
   ii) What is Barton reaction? Discuss its mechanism and give one application. (04)
   iii) Explain photochemical cross coupling and photodimerization of alkenes. (04)
   iv) Write a note on chemiluminescence. (04)

b) Answer any ONE of the following:
   i) Explain photocycloaddition reactions of aromatic rings. (04)
   ii) Complete the reactions:

   ![Chemical Structures]

   Complete the reaction and name the reactive intermediate

   \[ \text{N}_2\text{CH} - \text{COOC}_2\text{H}_3 \xrightarrow{hv} \text{A} \xrightarrow{Benzene} \text{B} \]

5. Answer any FOUR of the following:
   a) Give any two methods of preparation of benzyne.  (03)
   b) Complete the reaction and name the reactive intermediate

   \[ \text{N}_2\text{CH} - \text{COOC}_2\text{H}_3 \xrightarrow{hv} \text{A} \xrightarrow{Benzene} \text{B} \]
   c) Explain retro-Diels Alder Reaction. (03)
   d) What are 1,3-dipolar cycloadditions? Give two examples. (03)
   e) Explain the stereochemistry and the formation of major product by cope elimination of following compound:

   ![Chemical Structure]

   f) State Bredt’s rule. Bicyclo[3.3.2]dec-1-ene does not follow Bredt’s rule - Explain. (03)
   g) Explain - cis trans isomerization and hydrogen abstraction. (03)
   h) What is Photo-fries rearrangement? Give examples. (03)