Q.P. Code: 28407

[ Total Marks: 60

(2½ Hours)

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

1. (a) Attempt any two of the following: 8
   (i) Name the following compounds according to the system of nomenclature mentioned alongside the structure:--
   (I) Common name system
   (II) Hantzsch-Widman system
   (III) Hantzsch-Widman system
   (IV) Replacement nomenclature system

   (ii) Draw structures for the following:
   (I) 3,3-dimethylthietane
   (II) 1H-indazole
   (III) 1,2,4-thiadiazole
   (IV) Pyrrolo[3,2-b]pyridine.

   (iii) Complete the following reactions:--
   (I) \[ \text{H} + \text{CH}_3\text{COCl} \rightarrow \]
   (II) \[ \text{2-Naphthol, 10\% NaOH} \rightarrow 150^\circ C \]
   (III) \[ \text{COOC}_2\text{H}_5 + \text{C}_6\text{H}_5\text{NH}_2 \rightarrow \]
   (IV) \[ \text{KOH} \rightarrow \]

   (iv) How would you synthesise thiazoles from:
   (I) \( \alpha \)-halocarbonyl compound
   (II) Gabriel method.

1. (b) Attempt any one of the following: 4
   (i) Complete the following reactions:--
   (I) \[ \text{alkaline KMnO}_4 \rightarrow \Delta \]
   (II) \[ \text{conc. HNO}_3 \rightarrow \text{conc. H}_2\text{SO}_4 \]
(ii) Discuss the reactions of pyrazole with electrophilic reagents.

2. (a) Attempt any two of the following: 
   (i) How are methylation studies useful in the structure elucidation of lactose? 
   (ii) Explain the structural features and applications of Starch and Heparin. 
   (iii) What are flavones? Draw the structure of β-carotene & give analytical evidence of the presence of conjugated double bonds and the presence of two β-ionone units. 
   (iv) Give the synthesis of disparlure from 6-methylhept-1-ene.

2. (b) Attempt any one of the following: 
   (i) Give analytical evidence to prove the presence of the following in papaverine:- the presence of methylene group, four methoxy groups and isoquinoline unit. Also write the structure of papaverine. 

   (ii) Explain the structural features & biological importance of: Anthocyanins and Porphyrins.

3. (a) Attempt any two of the following: 
   (i) How is Longifolene synthesized from

   (ii) Outline the steps involved in the following conversion:-

   Write the structure of β-vetivone.

   (iii) How would you convert 6-methoxytryptamine and cyclohexanecarboxaldehyde derivative into reserpine ?

   (iv) Give the synthetic strategy for the synthesis of Longifolene. How is 4-Demethoxydaunomycin synthesized from
3. (b) Attempt any one of the following:
   (i) Write the structure of JH₃. What are prostaglandins? Give their classification and partial structures.
   (ii) Give analytical evidence for the structural determination of PGE₁.

4. (a) Attempt any two of the following:
   (i) Explain the principle of FT-IR spectroscopy. Discuss the applications of¹⁹F NMR spectroscopy.
   (ii) Draw the structures of the following compounds, label the protons and designate the spin system:
       (I) 1-Bromo-2-chloroethane
       (II) Pyrogallol
       (III) Pyrrole-2-carboxylic acid
       (IV) 2-Chloroethanol.
   (iii) What is relaxation? Explain longitudinal (spin-lattice) relaxation.
   (iv) Two organic compounds [A] and [B] having molecular formula C₇H₁₀O₂ exhibit strong absorption at 1735 cm⁻¹ in their IR spectra. Their ¹H NMR data is as follows:
       Compound[A]: 0.93 (6H, d), 1.52 (2H, m), 1.69 (1H, m), 2.04 (3H, s) and 4.10 (2H, t) ppm.
       Compound[B]: 0.94 (6H, d), 1.15 (3H, t), 1.91 (1H, m), 2.33 (2H, q) and 3.86 (2H, d) ppm.
       Deduce the structures for compounds [A] and [B] with justification.

4. (b) Attempt any one of the following:
   (i) An organic compound with molecular formula C₆H₅NO₃ shows the following infrared and NMR spectra. Interpret the given spectral data with possible structure of this compound:
       IR (cm⁻¹): 3460 (s), 3035 (m), 1608 (m), 1585 (m), 1510 (s), 1360 (s), 1320 (s) and 740 (s).
       ¹H NMR δ (ppm): 7.25 to 7.39 (4H, unsymmetrical pattern) and 7.9 (1H, s).
   (ii) What is nuclear overhauser effect (NOE)? What is its significance? Give two examples of NOE effect.

5. Attempt any four of the following:
   (a) Name the following compound by
       Common name system,
       Hantzsch-Widman system and
       Replacement nomenclature system

   (b) Discuss the ring opening reactions of oxirane with nucleophiles.
   (c) Write note on deoxysugar. Give the importance of pheromones.
   (d) Give the synthesis of ubiquinone from 3,4,5-trimethoxyacetophenone.
   (e) Draw the structure of JH₂. Give a brief account of aryl acetic acid as plant growth regulators.
   (f) What are insect growth regulators? Write structural features of gibberelic acids.
   (g) Discuss in brief: Long range coupling.
   (h) A compound C₃H₅N exhibits in its IR spectrum a peak at 2250 cm⁻¹. On reduction with LiAlH₄ it forms, C₃H₅N the IR spectrum of which lacks the peak at 2250 cm⁻¹ instead records two peaks at 3300-3500 cm⁻¹. Write this reaction and interpret the given IR spectral values with possible structures in this reaction.