Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF APPLIED SCIENCE

M.Sc. Winter 2019-20 Examination

Semester: 3 **Date: 03/12/2019**
Subject Code: 11205204 **Time: 02:00 pm to 04:30 pm**
Subject Name: Spectroscopy of Organic Compounds **Total Marks: 60**

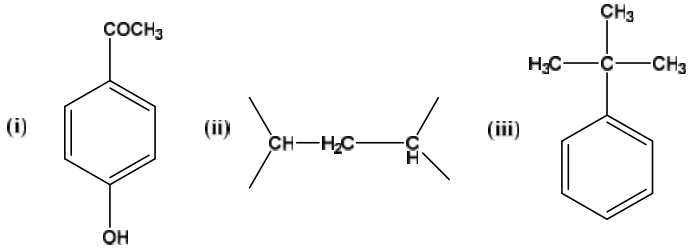
Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) Brief note (4x2) (Each of 04 marks) **(08)**
(a) Write a detail note on anisotropy in alkynes & annulenes family in detail
(b) Draw a schematic Diagram of NMR instruments and explain in detail.

Q.1. B) Answer the following questions (Any two)
(a) Short note (2x2) (Each of 02 marks) **(04)**
1. Define Spin-Spin relaxation. Give its symbol.
2. How will you differentiate p-amino phenol & o-amino phenol?
(b) Write a short note on effect of hydrogen bonding in NMR. **(04)**
(c) How ^{1}H NMR spectroscopy is useful for quantitative analysis? Explain using chlorination of toluene. **(04)**

Q.2. A) Answer the following questions.
(a) Write a detail note on Lanthanised Shift Reagent. **(04)**
(b) Explain Double resonance – selective decoupling experiment with example. **(04)**

Q.2. B) Answer the following questions (Any two)
(a) Write a short note on NOE (Nuclear Over Houser Effect). **(03)**
(b) Discuss DEPT technique in detail. **(03)**
(c) Count ^{13}C Signals in following compounds. **(03)**



Q.3. A) Essay type/ Brief note (4x2) (Each of 04 marks) **(08)**
(a) Why butadiene absorbs at longer wavelength than ethene?
(b) (i) Explain π- π* transition in hydrogen molecule.
(ii) Explain n- π*transition with an example.

Q.3. B) Answer the following questions (Any two)
(a) From1,3-pentadiene and 1,4-pentadiene, which will absorb at longer wavelength & why? **(04)**
(b) Explain the various electronic transitions in organic molecules. **(04)**
(c) Explain the terms (i) Hyperfine splitting (ii) Zero field splitting **(04)**

Q.4. A) Answer the following questions.
(a) A compound having molecular formula C_3H_6O, shows the following spectral data. Deduce its structure on the basis of following various spectroscopic data & Explain. **(04)**
Mass Fragments: 58 (Molecular ion peak – M^+), 43, 15
IR (Cm^{-1}): 1720, 1354 (s), 1154
^{1}H NMR (∂ ppm): one Singlet S ∂ 2.4 for 6H, **^{13}C NMR (∂ ppm):** 210, 16
(b) A compound which burns with sooty flame having molecular formula $C_8H_8O_2$, shows the following spectra. Deduce its structure on the basis of following various spectroscopic data & Explain. **(04)**
Mass Fragments: 136 (Molecular ion peak – M^+), 121, 119, 93, 76
IR (Cm^{-1}): 3600-3300 (Broad), 3007, 2923, 1662, 1596, 1498, 1364, 1263, 1190
^{1}H NMR (∂ ppm): 8.69 (S-Broad, 1H), 7.92 (d, 2H, J = 8.4Hz), 6.99 (d, 2H, J = 8.2 Hz), 2.61 (S, 3H).
^{13}C NMR (∂ ppm): 202, 162, 132, 129, 115, 26

Q.4. B) Answer the following questions (Any two)

(a) There are eight protons in an organic compound comprising all eight protons gave triplet at ∂ 3.2 ppm in ^{1}H NMR spectrum. There are two oxygen atoms also in compound. Propose the structure with reason. **(03)**

(b) There are only two signals in ^{1}H NMR spectrum of an organic compound having molecular formula C_7H_6O. One signal appeared as downfield singlet ∂ 9.1 for 1H and other signal appeared as multiplate ∂ 7.7-7.9 for 5H. Suggest the structure with reason. **(03)**

(c) In an aromatic compound having molecular formula C_9H_{12} having only two signals in 1H NMR spectrum. Nine protons appeared as singlet at ∂ 2.3 and other three protons appeared as multiplate at ∂ 7.0. Propose structure with reason. **(03)**