16

2M4M19209 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March /April 2019

MPHY4B12 – Atomic & Molecular Spectroscopy

(2017 Admission onwards)

Time: 3 hours Max. weightage: 36

SECTION A

Answer all questions, each has a weightage 1.

1. Explain stimulated Raman effect.
2. Write a note on chemical shift. Explain the different contributions to chemical shift.
3. Explain how indirect spin spin interaction affects NMR spectrum.
4. Explain Franck Condon principle. How does it explain the intensity of spectral line?
5. Why do we say that Raman spectrum is complementary to IR spectrum?
6. Diatomic molecules such as CO,HF will show a rotational spectrum whereas N_2, H_2,O_2... will not .why?
7. What is centrifugal distortion? Explain the effect of centrifugal distortion on the moment of inertia and energy of diatomic molecules.
8. Explain why the spacing between the lines in the P and R braches of CO_2 is 4B the instead of the expected 2B.
9. What are overtone bands?
10. Explain the principle of FTIR spectroscopy.
11. Spectral lines have finite width. Explain.
12. What are Fortrat parabola?

(12x1=12Weightage)

SECTION B

Answer any two questions, each has weightage 6.

13. Derive expression for spin orbit interaction energy. Obtain the spectral terms arising from two equivalent p electrons.

14. Explain the classical theory and quantum theory of Raman scattering. Briefly explain Raman spectrometer.

15. (a) Derive the expression for energy of rotational state of non-rigid diatomic molecules.
    (b) Explain how inter nuclear distance of diatomic molecules can be evaluated from rotational spectrum.

16. (a) Explain the theory of ESR spectra.
    (b) Explain the hyperfine structure in ESR spectra.

(2x6=12 Weightage)

SECTION C

Answer any four questions, each has weightage 3.

17. The term symbol for an atomic state is $^2p_{3/2}$.What are the values of L,S and J for this state. What is g value? What type of Zeeman effect this atom will give?

18. Draw the energy level diagram and allowed transition for an electron coupled to a nucleus of spin I=1(neglecting I.B interactions).

19. The first line in the rotational spectrum of CO has frequency 3.3424 cm^{-1}. Calculate B and the length of C-O bond.

20. Evaluate stretching frequency of OD if that of OH is 3700cm^{-1}.

21. Calculate the recoil velocity of a free Mossbauer nucleus of mass $1.67x10^{-25}$ Kg. when emitting a γ-ray of wavelength 0.1 nm. What is the doppler shift of the γ-ray frequency to an outside observer?

22. A free electron gives resonance at a frequency of 19.0GHz when the magnetic field is 1.02 T. Determine the frequency at which the resonance will occur if the magnetic field is 4.08T.

(4 x 3 = 12 weightage)

17

2M4M19210 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March /April 2019

MPHY4E2(6) – Lasers & Fibre Optics

(2017 Admission onwards)

Time: 3 hours Max. weightage : 36

Part A
Answer all questions
Each question carries l weightage

1. What are Einstein's coefficients
2. Why is it difficult for lasing in a two level system
3. Explain radioactive transition and spectral width
4. Write a note on optical resonators
5. What is meant by mode locking
6. Explain briefly, the second harmonic generation
7. Compare index profile in a step index monomode and graded index monomode optical fibre
8. Discuss major causes of absorption losses in optical fibres
9. Give the idea of monomode dispersion
10. What are the main advantages of optical fibres over metallic wave guides
11. Derive relation between numerical aperture and acceptance angle
12. What are leaky modes in an optical fibre

(12 x 1 = 12 weightage)

Part B
Answer any two questions
Each question carries 6 weightage

13. Discuss the concept of optical resonator. What are cavity modes. Explain Q factor of a cavity
14. Explain a typical 3 level laser system and obtain the condition for sustained laser oscillation
15. Explain the principle of optical fibre and show that it can act as a wave guide
16. With help of block diagram explain OTDR. Mention its application to characterize an optical fibre

(2x6= 12 weightage)

Part C
Answer any four questions
Each question carries 3 weightage

17. The wave length of emission is 6000 A and coefficient of spontaneous emission 10^6/ sec. Determine the coefficient of stimulated emission.
18. Write a note on laser induced fusion
19. Derive expression for the threshold pumping per unit volume required to maintain population inversion in a thee level laser system
20. Determine the cut off wave length for a stepped index fibre to exhibit single mode operation where $\mu_{core} = 1.46$, $radius - 4.5\mu m$.. The relative index variation is 0.25%
21. What is the distinction between meridional rays and skew rays.
22. An optical fibre has length 150m and fed with an optical signal of power, 10 μ W. The output power measured to be 8 μ W .Calculate the power loss per kilometer

(4 x 3= 12 weightage)

M4M19211 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March /April 2019

MPHY4E3(6) – Microprocessors and Applications

(2017 Admission onwards)

Time: 3 hours Max. weightage: 36

Section A

Answer All Questions, each carries 1 weightage.

What are stack? How stack is handled in 8085?

What is the significance of the instruction DAA in 8085? How the operation is achieved?

Distinguish between memory mapped I/O scheme and I/Omapped I/O schemes?

Explain the two modes of DMA data transfer?

Explain the functions of the signals i) ALE ii) S1 and S0

Distinguish between Instruction cycle and machine cycle

How control signals for memory and I/O devices are generated from the basic control/status signals of 8085?

What is USART? Name a USART compatible with 8085.

Name the operating modes of 8253.

10. What are the major components of a data acquisition system? Explain.

11. Explain the principle of successive approximation technique of analog to digital conversion

12. Explain the register organization of 8051

(12x1=12 weightage)

Section B

Answer any Two, each carries 6 weightage.

13. Discuss the instruction format and addressing modes of 8085 microprocessor

14. Discuss the interrupt process of 8085, with the help of a block diagram

15. Discuss the salient features of PPI 8255? With suitable example explain how the chip is programmed?

16. With the help of a schematic diagram show and explain the interfacing of an ADC with microprocessor 8085 through a sample and hold circuit and analog multiplexer.

(2x6=12 weightage)

Section C

Answer any Four, each carries 3 weightage.

17. Write an ALP to find 2's complement of a 16 bit number
18. Write an ALP to transfer 10 numbers stored in consecutive memory locations from 8000 onw 9A00 onwards.
19. Draw the timing of the instruction MVI B 28 H
20. Explain the measurement of frequency of a sine wave using microprocessor based system.
21. Show the interfacing of 7 segment LED display through decoder / driver and write an ALP to the number 3
22. How the instructions SIM and RIM interpret the accumulator?

(4x3=12 wei