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1M4M18209 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March 2018

PHY4C12 – Atomic & Molecular Spectroscopy

(2016 Admission onwards)

Max. Time: 3 hours Max. weightage: 36

SECTION A

Answer all questions, each has a weightage 1.

1. Explain hyperfine structure of ESR spectrum.
2. Write a short note on the application of Mossbauer spectroscopy.
3. Explain Hyper Raman Effect.
4. Explain the magic angle spinning of NMR and give its importance.
5. Explain the terms recoilless emission and absorption.
6. How does the idea of relaxation process explain the intensity of NMR spectrum?
7. Explain vibrational coarse structure and Deslandre's table.
8. Explainthe terms dissociation and predissociation.
9. Write a note on NMRI.
10. The intensity of J=0→ J=1 is often not the most intense rotational line. Why?
11. What is stark effect? What is the importance of stark effect in the analysis of rotational spectrum?
12. Explain why homonuclear diatomic molecules are not microwave or infrared active but they give rise to a rotational spectrum.

(12x1=12Weightage)

SECTION B

Answer any two questions, each has weightage 6.

13. Explain the principle of Fourier transform IR spectroscopy with a block diagra explain the working of a Fourier transform IR spectrometer.

14. (a)Explain how the ^{57} Fe nuclear energy levels of spin ½ and 3/2 are affected by monopole , electric quadrupole and nuclear Zeeman interactions.

    (b) Obtain Zeeman pattern in sodium D1, D2 lines.

15. (a) Explain the classical and quantum theory of Raman scattering.

    (b)Describe with suitable examples, how combined use of Raman and IR spectra the structure determination of molecules.

16. (a) Explain the instrumentation of NMR spectroscopy.

    (b) With necessary theory discuss rotational spectrum of a symmetric top molecul

(2x6=12 Wei

SECTION C

Answer any four questions, each has weightage 3.

17. The rotational spectrum of HF has lines 41.9 cm^{-1} apart. Calculate the moment and bond length of this molecule.

18. ^{33}S has a nuclear spin, I=3/2 a nuclear g factor 0.4289. Calculate the allowed energy for ^{33}S in a magnetic field of strength 7.5T?

19. Calculate the recoil velocity and energy of a free Mossbauer nucleus ^{57}Fe, when gamma ray of frequency $3.5x10^{18}Hz$. Obtain the doppler shift of the gar frequency to an outside observer.

20. The fundamental band of HCL is found at $2886cm^{-1}$. Calculate the wavenumbe first line from P and R branches. The bond length of HCL molecule is 0.1276 nm

21. The rotational analysis of a band system is given by $\bar{\upsilon}= 26241+14m-1.2m^2$. De position of band head and values of B' and B''.

22. Predict the fundamental modes of vibration of a triatomic molecule of type XY_2 possibilities of linear symmetric, bent symmetric and linear asymmetric cases. H of them are IR, Raman and both IR and Raman active.

(4 x 3 = 12 w

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March 2018

PHY4E13 – Lasers & Fibre Optics

(2016 Admission onwards)

Max. Time: 3 hours Max. weightage : 36

Part A

Answer all questions

Each question carries l weightage

1. Explain population inversion. List conditions to be satisfied to have low threshold population inversion
2. Obtain laser rate equation. Explain the meaning.
3. Describe the excitation mechanism in a He-Ne laser
4. Explain the principle of Holography
5. What is meant by spatial frequency filtering
6. What is self focusing? How is it achieved
7. Define numerical aperture of an optical fibre. Obtain its expression
8. What is evanescent wave. Explain its importance
9. Distinguish between meridional rays and skew rays
10. What is attenuation in optical fibre. How does it affect power transmission
11. Explain EH and HE hybrid modes
12. How refractive index is measured using transmitted near field technique

(12 x 1 = 12 weightage)

Part B

Answer any two questions

Each question carries 6 weightage

13. Derive expressions to Einstein coefficients. Show its effect on transmission probability and population inversion
14. Explain stimulated Raman scattering and self focusing
15. Discuss the various attenuating losses in optical fibers
16. Explain the mode of propagation of light waves through a graded index fibre?
17. Discuss the measurement of fibre loss by cut-fibre method

(2x6= 12 weightage)

Part C
Answer any four questions
Each question carries 3 weightage

18. What is line broadening? Derive an equation for frequency distribution of radiation causing transition

19. The upper and lower levels of a 2-level system separated by 1.8 ev energy. Find the rat of stimulated emission to spontaneous emission at a temperature 300 K

20. A ruby rod of length 10 cm and cross sectional area 1 cm^2 has chromium ion of density 1.58×10^{19} Cm^{-3}. The absorption coefficient for 694.3 nm lines is 0.2 cm^{-1}. .Assumin 20% fractional intensity loss with refractive index 1.78, estimate the total pulse energy

21. Define acceptance angle and numerical aperture of optical fibre. Derive expression fo acceptance angle

22. A stepped index optical fibre of diameter 50 μm has a numerical aperture of 0.23. If wave length of signal is 0.82 μm determine the number of modes in the cable.

23. Describe the bending loss probable in single mode optical fibre. Write expression for micro bend loss in a single mode and multimode fibres. Explain terms involved.

(4 x 3= 12 weight

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March 2018

PHY4E20 – Microprocessors and Applications

(2016 Admission onwards)

Max. Time: 3 hours Max. Weightage: 36

Section A

Answer All Questions, each carries 1 weightage.

1. List the four register pairs in 8085. How they are designated in an instruction
2. What does the following instructions of 8085 represent
   i) RRC
   ii) RAL
3. Explain address data multiplexing? Mention its advantage?
4. Why asynchronous data transfer is called hand shaking mode?
5. How Serial data transfer is achieved in 8085?
6. What are the situations in which microprocessor enter in to Bus Idle machine cycle?
7. What is interfacing? Why it is necessary?
8. Explain the modes of operation of PPI 8255.
9. What are the functions of a DMA controller?
10. Explain the role of sample and hold circuit in a data acquisition system. Define acquisition time and aperture time.
11. What is the need of a clock for A/D conversion? How it is generated?
12. Explain the working of multiple digit display.

(12x1=12 weightage)

Section B

Answer any Two, each carries 6 weightage.

13. Discuss the internal architecture of 8085, with the help of a neat sketch.
14. Explain instruction cycle and machine cycle. Show and explain the timing of opcode fetch operation
15. How the control word register of 8253 is programmed? Discuss the various operating modes of 8253.
16. Why do we need A/D and D/A converters? With the help of a schematic diagram explain the realisation of ADC using DAC.

(2 x 6 = 12 weightage)

Section C

Answer any Four, each carries 3 weightage.

17. Write an ALP to find smallest number in a data array
18. Identify the Machine cycles involved and addressing modes of following instructions
    i) LDA 8500 H
    ii) MOV A, M
    iii) MVI M, 05H
19. List the four instructions associated with the interrupt control of 8085 and explain their actions.
20. How serial data transmission is achieved using communication interface 8251.
21. How a square wave of desired frequency is generated using a microprocessor based system, show the interfacing and write the ALP.
22. Explain the organisation of internal RAM and special function registers of 8051?

(4x3=12 weightag