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1M4M20212 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March/April 2020

MPHY4E3(6) – Microprocessors & Applications

(2018 Admission onwards)

Time: 3 hours Max. Weightage : 36

Section A

Answer all questions.

Each question carries 1 weightage

1. What is an assembler?
2. Write an assembly language program to find the difference between two 8-bit numbers
3. What is one's complement of a number? Give an example.
4. Define timing diagram.
5. What is memory interfacing?
6. What is DMA?
7. Briefly discuss the features of programmable interrupt controller.
8. What is a control word?
9. Define acquisition time & aperture time.
10. How can a microprocessor-based system be used for resistance measurement?
11. What is a thermistor?
12. Distinguish between microprocessor and microcontroller.

(12×1 =12 weightage)

Section B

Answer two questions.

Each question carries 6 weightage.

13. Draw the architecture of 8085 microprocessor and explain the various functional units.
14. Discuss the programmed data transfer and direct memory access data transfer schemes with necessary examples.
15. Discuss the various modes of operations of programmable peripheral interface 8255.
16. Describe the working of 7 segment units to display alphabets & digits.

(6×2 =12 weightage)

Section C

Answer four questions.
Each question carries 3 weightage.

17. Write an assembly language program to sort an array of numbers in ascending
18. Draw the timing diagram for the Memory Read machine cycle.
19. Discuss the programmable communication interface 8251.
20. Explain the temperature measurement & control based on a microprocessor tec
21. What is Sample and Hold circuit? Discuss how it is interfaced with analog multiplexer in ADC 0800.
22. Discuss the important registers in 8051 microcontroller.

(3×4 =12 wei

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March/April 2020

MPHY4E2(6) – Laser and Fibre Optics

(2018 Admission onwards)

Time: 3 hours Max. Weightage : 36

Section A
(Answer ALL questions, each carries weightage 1)

1. Write a short note on Q –switching of lasers.
2. What is meant by natural line broadening in lasers?
3. Discuss Second Harmonic Generation of Light?
4. What is meant by numerical aperture of optical fibers?
5. Discuss mode locking technique in laser cavity.
6. Draw energy level diagram of a four level Laser system.
7. What are the different attenuation measurement techniques for fibers?
8. Discuss about leaky modes.
9. What are the advantages of graded index optical fibers?
10. What are stable resonators?
11. Distinguish between mono mode and multimode fiber.
12. Write a short note on Laser fusion.

(12 x 1 =12 weightage)

Section B
(Answer ANY TWO questions, each carries weightage 6)

13. With the help of energy level diagram ,explain excitation mechanism and laser structure of a He-Ne laser
14. Analyse the optical resonators using geometrical optics and hence obtain the condition to be satisfied for a stable resonator.
15. Discuss the major signal degradation in optical fibers.
16. Analyse light propagation through optical fibers using Maxwell's equations.

(2 x 6 =12 weightage)

Section C
(Answer any FOURquestions, each carries weightage 3)

17. A Laser produces 10mW beam of light at 632.8 nm .Find the number of photons emitted by the laser in eachsecond.
18. The cavity of a 6328 A^0 laser is 1 m long and has mirror of reflections 100% and 97.5% with negligible internal cavity losses (a) what is the cavity life time (b) If the output of Laser is 50 mW, calculate the energy inside the cavity.
19. Find the acceptance angle and numerical aperture of an optical fiber with a clad index of 1.378 and a core index of 1.546
20. Find the laser fusion energy released from a deuterium pellet with a factional burn up of the fuel f= 0.045.(Mass of the deuteron is $2 \times 1.66 \times 10^{-27}$g)
21. Find the longitudinal mode spacing of a laser resonator of cavity length d=100 cm. Assume cavity is filled with free space.
22. Calculate the percent of power lost when light moves from air to glass when the angle of incidence is 0^o.

(4 x3 = 12 weightage)

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Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester M.Sc Degree Examination, March/April 2020

MPHY4B12 – Atomics and Molecular Spectroscopy

(2018 Admission onwards)

Time: 3 hours Max. Weightage : 36

Section A

Answer all questions, each has weightage 1.

1. What is the importance of Lande g factor?
2. Comment on Larmor precession.
3. Explain why the rotational spectrum of symmetric top molecule is independent of quantum number K.
4. How the knowledge of centrifugal distortion constant helps one to determine the force constant of a bond?
5. Explain inverse Raman scattering.
6. Intense light sources are needed for the observation of nonlinear Raman Effect. Why?
7. What is Fortrat parabola?
8. Explain Hunde's rule with example.
9. Comment on Lande g factor.
10. Describe the classification of molecules based on their moments of inertia with examples.
11. Comment on 'hot bands' in IR spectra.
12. Explain mutual exclusion principle.

(12×1= 12 weightage)

Section B

Answer any two questions, each has weightage 6.

13. Explain the L-S and J-J coupling schemes in a strong magnetic field with the help of a vector model.
14. Obtain an expression for the vibration levels of a diatomic molecule. Derive expressions for the frequencies of fundamental absorptions, first and second overtones.

15. Describe the theory of ESR and explain the origin of hyperfine structure with one example.
16. Describe the classical and quantum theory of Raman Effect. Explain the difference between CARS and PARS

(2×6= 12 weightage)

Section C
Answer any four questions, each has weightage 3.

17. Calculate the energy in cm^{-1} of the photon absorbed when NO molecule goes from the state $v = 0, J'' = 0$, to $v = 1, J' = 1$. Assume the $v = 0$ and $v = 1$ states have the same B values. Given $\bar{v}_e = 1904\, cm^{-1}\, x_e = 0.00733, r_{NO} = 0.1151\, nm.$
18. The first line in the pure rotational spectrum of $^{1}H^{35}Cl$ appears at 21.18 cm^{-1}. Find the value of the rotational constant for $^{2}D^{35}Cl$. Given the atomic mass of D as 2.015 amu. Assume that the bond length in DCl is same as that in HCl.
19. The fundamental and first overtone transitions of $^{14}N^{16}O$ are centered on 1876.06 cm^{-1} and 3724.20 cm^{-1} respectively. Evaluate the equilibrium vibration frequency, the anharmonicity constant, zero point energy and force constant of the molecule.
    [mass of $^{14}N = 23.25 \times 10^{-27}$ kg ,
    mass of $^{16}O = 26.56 \times 10^{-27}$ kg]
20. Explain the intensity of vibrational – electronic spectra with help of Frank – Condon principle.
21. Calculate the recoil velocity and energy of the free Mössbauer nucleus ^{57}Fe when emitting a γ-ray of frequency 3.5×10^{18} Hz. What is the Doppler shift of the γ-ray frequency to an outside observer? Avogadro's number = 6.023×10^{23} mol^{-1}.
22. Electron spin resonance is observed for atomic hydrogen with an instrument operating at 9.5 GHz. If the **g** value for the electron in the hydrogen atom is 2.0026, and given that $\mu_B = 9.274 \times 10^{-24}$ JT^{-1}. Calculate the applied magnetic field

(4×3= 12 weightage)