1B5N19309 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2019

BPHY5B09 – Electronics(Analogue & Digital)

(2017 Admission onwards)

Time: 3 hours Max. Marks: 80

Section A

Answer all questions

Each question carries 1 mark

1. The basic purpose of a filter is ---------
2. The leakage current in CE configuration ---------- as that of CB arrangement
3. In AM modulation bandwidth is ---------of an audio signal frequency
4. The gate of JFET is ---------- biased
5. The ----- gate is called "Any or All gate"

Write true or false

6. Negative dc feedback through RE is responsible for the stabilization of the operating point in a potential divider method.
7. For oscillation to start the loop gain $A\beta$ of the oscillator must be greater than unity.
8. The overall voltage gain of a multistage amplifier is obtained by adding the voltage gain of each when expressed as a voltage ratio.
9. NOR gate is OR gate followed by NOT gate.
10. The base of hexadecimal number system is 8.

(10 x 1=10 marks)

Section B

Answer all questions

Each question carries 2mark

11. Discuss the importance of peak inverse voltage in rectifier circuit.
12. Explain the principle of light emitting diode.
13. Derive the relation between α and γ.
14. Define Q point of transistor circuit.
15. Distinguish between amplifier and oscillator.
16. What are the different number systems? Give example.
17. Write the Boolean expression for Exclusive OR gate and represent it using basic gate.

(7 x 2 = 14 marks)

Section C

Answer Anyfive questions

Each question carries 4mark

18. Describe the working of half wave voltage doubler.
19. Explain the following terms (1) voltage gain (2) power gain (3) effective collector load.
20. Discuss the essentials of an oscillator.
21. Write a short note on floating point number representation.
22. Define JFET parameters and establish the relationship between them.
23. With the help of a diagram explain RS flip flop.
24. Derive an expression for the voltage gain of a noninverting amplifier.

(5 x 4=20 Marks)

Section D

Answer any four questions

Each question carries 4 marks

25. It is desired to obtain a maximum of 15V(dc) from bridge rectifier circuit that it uses silicon diodes, energized from an AC main supply 220V,50Hz through a step down transformer . Find the turns ratio of this transformer.
26. Calculate the value of $R_C$and $R_B$in collector feedback method,if the dc operating point is fixed at V_{CE}= 7V, I_C= 5mA (Vcc = 10V, β_{dc}= 100).
27. A feedback amplifier has an internal gain A=40db and feedback factor = 0.05. If the input impedance of this circuit is 12KΩ what would have been the input impedance of the amplifier if feedback is not present.
28. In a Unijunction transistor $\dot{\eta}$ = 0.8, V_P= 10.3 V and R_{B2} = 5KΩ. Determine R_{B1} and V_{BB}
29. Prove the Boolean identities
    a) $\overline{(AB)}(\bar{A}B)\,(A+\bar{B}) = \overline{A+B}$
    b) $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C = \bar{B}$
30. In a common base configuration current gain is 0.9, if the emitter current is 1mA. Calculate the base current.
31. Convert the following real numbers in to binary.
    a)$(123.88)_{10}$ b) $(100.01)_{10}$ c) 25.775 d) 58.125

(4 x 4=16 Marks)

Section E

Answer any two questions.

Each question carries 10 marks.

32. Explain RC coupled amplifier with special reference to frequency response.advantage. disadvantage and application.

33. What is amplitude modulation? Analyze the amplitude modulated wave and arrive the sideband frequencies.

34. Discuss the input and output characteristics of common emitter transistor configuration. Why CE configuration is used for all transistor application?

35. (a) With the help of the truth table explain the functions of full adder.

    (b) Using examples. illustrate the addition of 3-bits by full adder.

(2 x 10=20 Marks)

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Fifth Semester B.Sc Physics Degree Examination, November 2019

BPHY5B07 – Quantum Mechanics

(2017 Admission onwards)

Time: 3 hours Max. Marks: 80

The symbols used in this question paper have their usual meanings.

Section A

Answer all questions in a word or phrase.
Each question carries 1 mark.

1. The quantity that varies in a matter wave is _____
2. Find the quantum number of the Bohr orbit whose radius is .02mm?
3. What is the physical interpretation of the statement $\int_{-\infty}^{\infty} |\Psi|^2 dv=0$
4. The momentum operator is given by _____
5. Give the name of the function which has got its own Fourier transform?

Write True or False

6. Biological materials can be studied with the help of STM.
7. The ionization energy of hydrogen is -13.6 eV.
8. The Lyman series lies in the ultraviolet region of the spectrum.
9. The time independent Schrödinger equation is an eigen value equation .
10. The *s* state is spherically symmetric.

(10 x 1=10 marks)

Section B

Answer all questions in two or three sentences.
Each question carries 2 marks.

11. Does the concept of Bohr orbit violate uncertainty principle? Explain?
12. Write the advantages of electron microscope over light microscope?
13. Why incident wavelength is also present along with the scattered wavelength in the scattered ray of Compton Effect?
14. Why gravitational red shift is not apparent in the case of sun?

15. Why Schrödinger equation is called the basic principle of physics in itself?
16. Check whether the wave function $\psi(x) = 2$ is well behaved or not?
17. Give the selection rules?

(7 x 2=14 marks)

Section C

Answer any five questions in a paragraph of about half a page to one page.
Each question carries 4marks.

18. Explain the correspondence principle on the basis of harmonic oscillator.
19. Explain Franck Hertz experiment.
20. Draw and compare the energy levels of particle in a box, quantum harmonic oscillator and hydrogen atom.
21. Find the momentum Eigen values and Eigen functions of a particle trapped in a box L wide.
22. Show that the spin angular momentum is not due to the spin of the electron along its own axis.
23. Show that pair production cannot occur in empty space.
24. Show that the Planck radiation formula correctly explains the blackbody spectrum.

(5 x 4 =20 marks)

Section D

Answers any four questions.
Each question carries 4 marks.
Problems- Write all relevant formulas, all important steps carry separate marks.

25. An unstable elementary particle called the eta meson has a rest mass of 549 MeV/c^2 and a mean life time of 7.00 x10^{-19} seconds. What is the uncertainty in its rest mass?
26. In a Compton Effect experiment in which the incident x-rays have a wavelength of *10 pm*, the scattered x-rays at a certain angle have a wavelength of *10.5 pm*. Find the momentum (magnitude and direction) of the corresponding recoil electrons.
27. The longest wavelength in Lyman series is 121.5 nm and shortest wavelength in Balmer series is 364.6 nm. Use these figures to find out the longest wavelength of Pfund series.
28. The linear absorption coefficients of 2 MeV gamma rays are 4.9/m in water and 52/m in lead. What thickness of lead would give same shielding as 1 m of water?

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fifth Semester B.Sc Physics Degree Examination, November 2019

BPHY5B06 – Electrodynamics II

(2017 Admission onwards)

Time: 3 hours Max. Marks: 80

SECTION A
(Answer in a word or phrase)
Answer ALL questions: Each question carries 1 mark

1. Write down the relation between dielectric constant and refractive index of a non-ferromagnetic material like glass, wood etc.
2. A closed conducting path through which an electric current flows is called .....
3. Lenz's law is a consequence of law of conservation of .....
4. Write down the expression for the current in a pure capacitive circuit when a voltage of $E=E_0 \sin\omega t$ is applied.
5. The condition on L, C and R values for over-damping in series LCR circuit is .....

Questions 6 to 10: Write True or False

6. A circuit containing semiconductor diode is an example for bilateral circuit.
7. For a series LR circuit, greater the value of L/R more rapid is the current decrease.
8. Mutual inductance of a step up transformer depends on the current in the primary coil.
9. When an alternating current is allowed to pass through a series LR circuit, it satisfies Ohm's law.
10. $\mathbf{E} = \mathbf{E}_0 e^{i(kx-\omega t)} \hat{j}$ represents a plane polarised wave propagating in the Y-direction.

(10x1 = 10 marks)

SECTION B
(Answer in two or three Sentences)
Answer ALL questions: Each question carries 2 marks.

11. State Faraday's laws of electromagnetic induction.
12. When an alternating voltage of $E=E_0 \sin\omega t$ is applied to a circuit containing inductance only, draw the phasor diagram for the applied voltage, current flowing and the induced emf.
13. What do you mean by ideal constant voltage source? What will be its internal resistance?
14. Define intensity of electromagnetic wave and write down its formula.
15. What is polarisation current density?
16. Define time constant of a series RC circuit.
17. Write down the classical wave equation and describe the terms.

(7x2 = 14 marks)

SECTION C

(Answer in a paragraph of about half a page to one page)
Answer any FIVE questions: Each question carries 4 marks.

18. Obtain the expression for the flux of total energy flowing out through a closed surface in electromagnetic field.
19. Discuss the theory of a moving coil galvanometer.
20. State and explain Thevinin's theorem. Considering any arbitrary network, explain the different steps involved in thevenising a circuit.
21. Obtain Neumann formula for mutual inductance between two coils.
22. When a current of $I=I_0 \sin\omega t$ is passing through a series RC circuit, obtain the expression for the voltage applied and impedance of the circuit.
23. State and explain maximum power transfer theorem. Obtain the expression for the voltage and power across the load at maximum power transferring condition.
24. Explain how Maxwell corrected Ampere's law. Write down the four Maxwell's equations in electrodynamics.

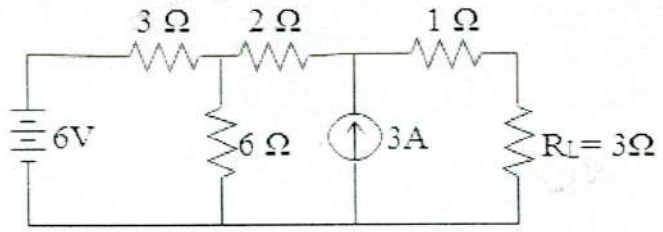
(5x4 = 20 marks)

SECTION D

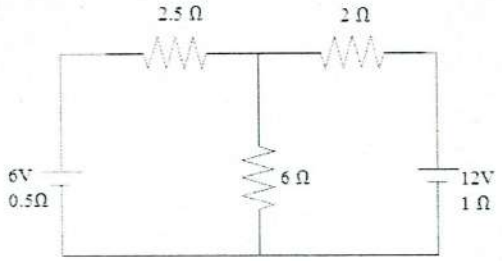
(Problems – Write all relevant formulas. All important steps carry separate marks)
Answer any FOUR questions: Each question carries 4 marks.

25. The frequency of electromagnetic wave propagating along the Z-axis is 0.6×10^{15}Hz. The amplitude of the sinusoidally varying electric field is 1.5 V/m. Find the average values of the electric and magnetic energy densities.
26. A square wire loop of side 10cm is perpendicular to a magnetic field of 40 gauss.
    a) What is the magnetic flux through the loop?
    b) If the field drops to zero in 0.1 seconds, what average emf will be induced in the circuit during this time?
27. A parallel plate air capacitor has circular plates of radius 5cm. It is being charged so that the electric field changes at a rate of 10^{12} V/m.second. Find the displacement current in it.
28. A resistance 'R' and a 2μF capacitor in series are connected to a 200 V direct supply. Across the capacitor there is a neon lamp that strikes at 120 V. Calculate the value of 'R' to make the lamp strike 5 seconds after switch has been closed.
29. An alternating emf of 10V and 100 cycles/seconds is applied to a 5H choke having ohmic resistance of 200 Ω. Find the power factor of the coil and power absorbed.

30. Use source conversion technique to find the load current in the circuit shown below.



31. Using superposition principle, find the different currents flowing in the branches and voltage across 6 Ω resistor for the circuit shown below.



(4x4 = 16 marks)

SECTION E

(Answer in about two pages)

Answer any TWO questions: Each question carries 10 marks.

32. Obtain the relation between the applied alternating voltage and current passing through a series LCR circuit and discuss its characteristics. Also obtain the expression for the impedance of the circuit.
33. Obtain the expression for reflection coefficient and transmission coefficient in terms of the refractive index of the medium for an electromagnetic wave falling normally on a medium.
34. a) What is self-induction? Define self-inductance in terms of the back emf.
    b) Show that energy can be stored in the inductor and also in magnetic fields.
35. Discus growth of charge in a series LCR circuit. **(2x10 = 20 marks)**