C 82452 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION APRIL 2020

Physics/Applied Physics

APH 2C 02—BASIC ELECTRONIC DEVICES AND CIRCUITS

Time : Two Hours Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answer Type)

Answer **all** *questions in two* **or** *three sentences, each correct answer carries a maximum of* 2 *marks.*

1. What do you mean by the knee and peak inverse voltage of a diode ?
2. How much is the effect of temperature on reverse saturation current of a diode ?
3. What is the Zener breakdown mechanism ?
4. What is the type of bias (forward/reverse) used in an LED and a photodiode ?
5. What is the basic principle of using transistor as an amplifier ?
6. What do you mean by thermal runaway of a transistor ?
7. Which transistor configuration is used for impedance matching purposes and why ?
8. What is the basic difference between a BJT and a JFET ?
9. Compare class A, B and C amplifiers based on their output waveform.
10. Draw schematically the construction of an *n*-channel MOSFET.
11. List two advantages of using negative feedback.
12. What is Barkhausen criteria ?

(Ceiling-20)

Section B (Paragraph/Problem Type)

Answer **all** *questions in* **a paragraph** *of about* **half a page** *to* **one page**, *each correct answer carries a maximum of* 5 *marks.*

13. Draw the circuit diagram of a halfwave rectifier indicating the input and output waveforms.
14. A Zener diode of breakdown voltage 6.2 V is used to regulate an input voltage which fluctuates between 9 V and 12 V. The diode is connected across a load of 1 kilo-ohms and a series resistance of 330 ohms. Calculate the maximum and minimum values of the Zener current.

Turn over

15. A transistor uses voltage divider method of biasing with R_1 = 50 kΩ, R_2 = 10 kΩ, R_E = 1 kΩ and V_{BE} = 0.1 V. If V_{CC} = 12V, find the collector current Ic.

16. What are de Morgan's theorems ? Verify them using a truth table.

17. Explain the basic parameters (i) a.c. drain resistance, (ii) transconductance ; and (iii) amplification factor of an FET.

18. Find the operating frequency of a Collpitt's transistor oscillator if C_1 = 0.001 μF, C_2 = 0.01 μF and L = 15 μH.

19. What is piezo-electric effect ? Write short note on the working of a crystal oscillator.

(Ceiling-30)

Section C (Essay Type)

Answer in about **two pages**, *any* **one** *question.*
It carries 10 *marks.*

20. Explain the working principle of a centre tapped full-wave rectifier. Obtain expressions for d.c. and a.c. values of the output.

21. What do you mean by the CE configuration of a transistor ? Explain the input and output characteristics of a transistor in CE arrangement.

(1 × 10 = 10 marks)

C 82450 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION, APRIL 2020

Physics/Applied Physics

PHY 2B 02/APH 2B 02—MECHANICS

Time : Two Hours Maximum : 60 Marks

Section A (Short Answer Type)

Answer **all** *questions in two* **or** *three sentences.*
Each correct answer carries a maximum of 2 *marks.*

1. Distinguish between inertial and non- inertial frames of reference.
2. Deduce an expression for fictitious force experienced by a particle in a co-ordinate system with uniform acceleration A.
3. What is the effect of Coriolis force on wind moving over the surface of earth ?
4. List any two features of central force motion.
5. State and explain principle of equivalence.
6. Derive the equation of motion of a mass suspended by a spring.
7. What is meant by the time average of a function f(t) ?
8. Define the Q-factor of an oscillator. What is its significance ?
9. Define simple harmonic motion. Give two examples.
10. Define the phase velocity of a wave.
11. What is the condition for a nondispersive wave ?
12. What is meant by the characteristic impedance of a travelling wave ?

(ceiling-20)

Section B (Paragraph/Problem Type)

Answer **all** *questions in a paragraph of about* **half a page to one page.**
Each correct answer carries a maximum of 5 *marks.*

13. Obtain the relation between accelerations of a particle with respect to an inertial system and that with respect to a rotating co-ordinate system of angular velocity Ω if the origins of the two systems coincide.
14. Determine the horizontal deflection of a particle dropped from a tower of height 50m at the equator. Also find out the time taken to fall through this height. (Angular velocity of earth is 7.29×10^{-5} radians/sec.

Turn over

15. A space vehicle of mass 3000kg is in circular orbit of radius 2R=12800km about the earth. What is the minimum energy required to transfer the vehicle to a circular orbit of radius 4R?(Radius of earth = 6400km)

16. Obtain an expression for minimum velocity with which a body on surface of the earth is to be projected to escape from the gravitational field. If the acceleration due to gravity on the moon is one sixth that of the earth, calculate the value of velocity of escape from surface of moon.(Radius of moon = 1.74×10^6m)

17. Find the Fourier co-efficients of the square pulse using Fourier integral.

18. A 0.3 Kg mass is attached to a spring and oscillates at 2 Hz with a Q of 60. Find the spring constant and the damping constant.

19. Derive the expression for energy of the damped harmonic oscillator. Plot the energy-time graph and explain.

(ceiling-30)

Section C (Essay type)

Answer any one question in about **two pages.**
Answer carries 10 *marks.*

20. State and prove Kepler's first and second laws of planetary motion.

21. Derive the expression for the phase velocity of sound in air using Newton's method. How does the observed value differ from the calculated value ? How is it rectified ?

(1 × 10 = 10)

C 82451 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION, APRIL 2020

Physics

PHY 2C 02—OPTICS, LASER, ELECTRONICS

Time : Two Hours Maximum : 60 Marks

Section A (Short Answer Type)

Answer **all** *questions in two* **or** *three sentences, each correct answer carries a maximum of* 2 *marks.*

1. What do you mean by the term coherence length ?
2. For interference in thin films in a reflected system, write down the condition for constructive and destructive interferences.
3. Compare Fresnel and Fraunhofer types of diffractions.
4. What do you mean by the grating constant of a plane transmission grating ?
5. It is possible to polarize a sound wave ? Why ?
6. What is Brewster's law ?
7. Distinguish between positive and negative doubly refracting crystals.
8. What are polaroids ? Mention two applications.
9. Write down de Morgan's theorems.
10. What do you mean by the term ripple factor ? Give its value for a half wave rectifier.
11. Distinguish between spontaneous and stimulated emission processes.
12. What do you mean by population inversion in a laser ? Name a mechanism to attain the same.

(Ceiling-20)

Section B (Paragraph/Problem Type)

Answer **all** *questions in* **a paragraph** *of about* **half a page to one page,** *each correct answer carries a maximum of* 5 *marks.*

13. Light of wavelength 5000 Å from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen placed 100 cm away is 0.5 cm, determine the fringe separation.
14. Calculate the minimum number of lines on a grating that will just resolve the sodium lines 5890 Å and 5896 Å in the first order spectrum.

Turn over

15. Show that when unpolarized light is passed through a polarizer, the intensity of the transmitted light is half that of the incident light.

16. Calculate the thickness of doubly refracting glass plate capable of producing a path difference of $\lambda/4$ between the ordinary and extraordinary waves. Given, the wavelength of light used λ = 5890 Å, refractive index for the ordinary ray = 1.54 and the refractive index for the extra ordinary ray = 1.53.

17. A 10 V Zener diode along with a series resistance is connected across a 40 V supply. Calculate the minimum value of the resistance required, if the maximum Zener current is 50 mA.

18. Show how an OR operation be realized using three NAND gates.

19. Using a suitable energy level diagram, explain the working principle of a Ruby laser.

(Ceiling-30)

Section C (Essay Type)

Essays. Answer in about **two pages**, *any* **one** *question.*
Answer carries 10 *marks.*

20. Using a neat diagram, discuss the method of forming Newton's rings by reflected light. Write down the condition for bright and dark rings. Obtain an expression for the radii of the rings formed.

21. What do you mean by the CE configuration of a transistor ? Drawing suitable figures, explain the input and output characteristics of a transistor in CE configuration.

(1 × 10 = 10 marks)