(6 pages) Reg. No. : .....

Code No. : 20350 E **Sub. Code : EMPH 51**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fifth Semester

Physics — Core

ELECTRICITY, MAGNETISM AND
ELECTROMAGNETISM

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The capacitance of a parallel plate capacitor is directly proportional to ————————.

   (a) distance between plates

   (b) area of plates

   (c) thickness of dielectric

   (d) potential difference

2. Which of the following is not a thermoelectric effect?

   (a) Seebeck effect

   (b) Joule effect

   (c) Thomson effect

   (d) Peltier effect

3. Which law explains the magnetic filed around a current carrying conductor?

   (a) Gauss's law

   (b) Faraday's law

   (c) Biot-Savart's law

   (d) Ampere's law

4. The SI Unit of magnetic flux is _____.

   (a) Weber (b) Maxwell

   (c) Henry (d) Tesla

5. Magnetic permeability (μ) is defined as ————.

   (a) B/H (b) H/B

   (c) M/H (d) B^2/H

6. A coil of 16 H is coupled with a coil of 4 H in such a way that coefficient of coupling is unity. Find the mutual inductance.

(a) 10 H (b) 8 H

(c) 12 H (d) 16 H

7. Which circuit element causes a phase difference between voltage and current in an AC circuit?

(a) resistance (b) inductance

(c) switch (d) battery

8. The resonance condition in an LCR circuit occurs when ————.

(a) $X_L = 0$ (b) $X_C = 0$

(c) $X_L = X_C$ (d) $R = 0$

9. The term added by Maxwell to Ampere's law is called ————.

(a) Induced current

(b) Conduction current

(c) Displacement current

(d) Eddy current

10. Which characteristics of an electromagnetic wave is affected by the medium through which it travels?

(a) time period (b) velocity

(c) wavelength (d) frequency

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the effect of dielectric in a capacitor.

Or

(b) Write short note on Peltier effects.

12. (a) State Ampere's circuital law and explain the divergence of magnetic field.

Or

(b) Explain torque on a current loop in a magnetic field.

13. (a) Write a short note on hysteresis loss.

Or

(b) Explain mutual inductance between two coaxial solenoids.

14. (a) Derive the expression for voltage across a capacitor in an RC charging circuit.

Or

(b) Write a short note on equality factor.

15. (a) Define displacement current and explain its significance.

Or

(b) Write a note on velocity of electromagnetic waves in free space.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the construction and working of Carey Foster Bridge.

Or

(b) Discuss the thermoelectric diagrams and their applications.

17. (a) Derive an expression for force on a current carrying conductor placed in a magnetic field and the magnetic force between two infinitely long conductors.

Or

(b) Give the theory of moving coil ballistic galvanometer.

18. (a) Describe an experiment to draw B – H curve.

Or

(b) Derive an expression for self-inductance of a solenoid.

19. (a) Derive an expression for charge and current in an LCR circuit.

Or

(b) Explain resonance in parallel LCR circuits and derive condition for maximum current.

20. (a) Derive Maxwell's equations in differential form in free space.

Or

(b) Explain electromagnetic wave propagation in linear homogenous media.

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Code No. : 20351 E **Sub. Code : EMPH 52**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fifth Semester

Physics — Core

ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The value of spin quantum number of an electron is

   (a) 1/2 (b) 1

   (c) 2 (d) 0

2. For p-electron the orbital angular momentum is

   (a) 0 (b) 1

   (c) 2 (d) 3

3. Zeeman effect is ———— phenomena.

   (a) electric

   (b) optic

   (c) magneto-optic

   (d) magnetic

4. The wavelength of sodium D_1 line is

   (a) 5890 Å (b) 5893 Å

   (c) 5894 Å (d) 5896 Å

5. The size of nucleus is of the order of

   (a) 10^{-15} mm (b) 10^{15} m

   (c) 10^{-15} m (d) 10^{-15} cm

6. Which one of the following is a magic number regarding nuclei?

   (a) 10 (b) 20

   (c) 30 (d) 40

7. Which of the following has more penetrating power?

   (a) gamma rays

   (b) beta rays

   (c) alpha rays

   (d) photon

8. Who discovered radioactivity?

(a) Marie Curie

(b) Henry Becquerel

(c) Rutherford

(d) Neils Bohr

9. Atom bomb works on the principle of

(a) alpha decay

(b) beta decay

(c) nuclear fission

(d) nuclear fusion

10. An example for charged particle detector is _____.

(a) Scintillation counter

(b) GM counter

(c) Cloud chamber

(d) All of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Describe, with a neat sketch, LS coupling.

Or

(b) Describe the experimental setup of Stern-Gerlach.

12. (a) Describe the term spectral notations.

Or

(b) Explain Stark effect.

13. (a) Calculate the mass defect, binding energy and binding energy per nucleon of ^{16}O. Given that mass of ^{16}O is 15.9949 amu.

Or

(b) List the characteristics of nuclear forces.

14. (a) The half-life of radium is 1590 years. In how many years will one gram of radium be (i) reduced by one centigram (ii) reduced to one centigram.

Or

(b) Describe the continuous beta ray spectrum.

15. (a) Discuss the energy released in fission reaction.

Or

(b) What are called radio isotopes? Give their applications.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the vector model of the atom. Also discuss any three quantum numbers associated with it.

Or

(b) Obtain an expression for magnetic moment of an electron due to orbital motion and spin motion. Also derive the expression for total magnetic moment of the electron.

17. (a) What is Zeeman effect? Give the quantum mechanical explanation.

Or

(b) Describe anomalous Zeeman effect with relevant theory. Also discuss the fine structure of sodium D lines.

18. (a) Describe the liquid drop model of the nucleus and give the merits of this model.

Or

(b) Explain the Shell model of the nucleus.

19. (a) List the properties of alpha, beta and gamma rays.

Or

(b) Explain the Gamow's theory of alpha decay.

20. (a) With a neat sketch and relevant theory, describe the construction and working of cyclotron.

Or

(b) Describe the construction and working of GM counter.

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Code No. : 20352 E **Sub. Code : EMPH 53**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fifth Semester

Physics — Core

ANALOG AND COMMUNICATION ELECTRONICS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Bridge rectifier is an alternative for
   (a) Full wave rectifier
   (b) Peak rectifier
   (c) Half wave rectifier
   (d) None of the mentioned

2. If input frequency is 50 Hz then ripple frequency of half wave rectifier will be equal to ————.
   (a) 100 Hz (b) 50 Hz
   (c) 25 Hz (d) 500 Hz

3. Which region of the transistor is highly doped?
   (a) Emitter
   (b) Base
   (c) Collector
   (d) Both Emitter and Collector

4. Transistor in power amplifier is ————.
   (a) An active device
   (b) A passive device
   (c) A operational amplifier
   (d) A voltage generating device

5. Negative feedback in amplifier ————.
   (a) Improves the signal-to-noise ratio at input
   (b) Improves the signal-to-noise ratio at output
   (c) Does not improve the signal-to-noise ratio at I/O
   (d) Reduce Distortion

6. Which of the following oscillator cannot be used in low frequency oscillations?

(a) Wein bridge oscillators

(b) RC phase shift oscillators

(c) Colpitts oscillators

(d) RC oscillators

7. Find the output voltage of an ideal op-amp. If V_1 and V_2 are the two input voltages

(a) $V_O = V_1 - V_2$

(b) $V_O = A \times (V_1 - V_2)$

(c) $V_O = A \times (V_1 + V_2)$

(d) $V_O = V_1 \times V_2$

8. Monostable multivibrator is/has ———— state.

(a) Stable

(b) Unstable

(c) One stable and another unstable

(d) Independent

9. What happens when the amplitude of the modulating signal is greater than the amplitude of the carrier?

(a) Decay

(b) Distortion

(c) Amplification

(d) Attenuation

10. What is the condition for greatest output power at the transmitter without distortion?

(a) Modulating signal voltage > Carrier voltage

(b) Modulating signal voltage < Carrier voltage

(c) Modulating signal voltage = Carrier voltage

(d) Modulating signal voltage = 0

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Discuss about the working of center tapped rectifier.

Or

(b) Calculate the efficiency and ripple factor of clamping circuits.

12. (a) Draw and explain the I-V characteristics of CB mode.

Or

(b) Analyze about on the power amplifier.

13. (a) State the Barkhausen's criteria for a circuit to be an oscillator.

Or

(b) List out the advantages of negative feedback.

14. (a) Explain differential amplifier.

Or

(b) Draw and explain the IC 741 pin configuration.

15. (a) Outline the concept of phase modulation.

Or

(b) Analyze on pulse width modulation.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the working of DC power supply with a block diagram.

Or

(b) Discuss about the zener diode is used as a voltage regulator.

17. (a) Explain hybrid parameters.

Or

(b) Discuss about the working of tuned amplifier.

18. (a) Explain Hartley oscillator.

Or

(b) Elucidate in detail about the working principle of phase shift oscillator with a neat diagram.

19. (a) Distinguish between inverting and non-inverting amplifier.

Or

(b) Describe about the working of astable multivibrator using IC 555.

20. (a) Explain amplitude modulation.

Or

(b) Compare PAM, PPM and PCM.

(6 pages) **Reg. No. :** .....

Code No. : 20357 E **Sub. Code : EEPH 53**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fifth Semester

Physics – Core

Elective – PYTHON PROGRAMMING AND BASICS OF AI AND DATA SCIENCE

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Who developed Python?

(a) Guido Van Rossum (b) Ritche

(c) Bill Gates (d) Sunder Pitchai

2. Which of the following character is used to give comments in Python Program?

(a) # (b) &

(c) @ (d) $

3. Which of the following is a Python tuple?

(a) {1, 2, 3} (b) {}

(c) (1, 2, 3) (d) [1, 2, 3]

4. Which function is typically used to generate a sequence of numbers in a for loop?

(a) list() (b) range()

(c) random() (d) sequence()

5. A Function which calls itself is called as

(a) built-in (b) lambda

(c) recursion (d) return

6. Which of the following keyword is used to begin the function block?

(a) define (b) def

(c) for (d) finally

7. Which of the following method is used as destructor?

(a) _del_() (b) _dest_()

(c) _rem_() (d) _init_()

8. Which of the following is the private class variable?

(a) $$num (b) _num

(c) ##num (d) &&num

9. In which year was the term "Artificial Intelligence" first used?

(a) 1943 (b) 1952

(c) 1956 (d) 1969

10. In statistics, what does "mean" represent?

(a) the most frequent value

(b) the highest value

(c) middle value in a dataset

(d) average of the values

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) List rules for naming identifiers.

Or

(b) Write a python program to check whether the given number is odd or even.

12. (a) Can an if statement be used without else or elif? Give an example.

Or

(b) Write a program to check whether the given number is positive, zero or negative.

13. (a) Explain the different types of function with an example.

Or

(b) Write a Python code to find the factorial of a number.

14. (a) How will you create destructor in Python?

Or

(b) Write a class with two private class variables and print the sum using a method.

15. (a) Define term artificial intelligence.

Or

(b) What is Data Science? Give any two uses.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Write python program for

(i) to convert the temperature in centigrade to Fahrenheit and vice versa.

(ii) to find the acceleration due to gravity using compound pendulum.

Or

(b) Explain input() and print() functions with examples.

17. (a) Explain the syntax for loop with examples.

Or

(b) Write a program to find the smallest of three numbers using if..else..elif statement.

18. (a) Explain the scope of variables with an example.

Or

(b) Explain mathematical functions.

19. (a) Write a program using class to accept three sides of a triangle and print its area.

Or

(b) Explain about constructor and destructor with suitable example.

20. (a) Explain the applications of artificial intelligence.

Or

(b) Describe the key skills required to become a Data Scientist.

———————