

Reg. No. :

Code No. 5015

Name :

Time : 2 Hours

Cool-off time : 15 Minutes

Second Year – March 2017

Part – III

PHYSICS

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool-off time'.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

നിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും. ഈ സമയത്ത് ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാനോ, മറ്റുള്ളവരുമായി ആശയവിനിമയം നടത്താനോ പാടില്ല.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- ഒരു ചോദ്യനമ്പർ ഉത്തരമെഴുതാൻ തെരഞ്ഞെടുത്തു കഴിഞ്ഞാൽ ഉപചോദ്യങ്ങളും അതേ ചോദ്യനമ്പറിൽ നിന്ന് തന്നെ തെരഞ്ഞെടുക്കേണ്ടതാണ്.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

1. A concave lens always produces _____ images.
(i) real (ii) virtual
(iii) magnified (iv) None of these (Score : 1)

2. A zener diode is always operated in _____ bias. (Score : 1)

3. Momentum of a photon with wavelength λ is _____.
(i) $h\lambda$ (ii) $\frac{h}{\lambda}$
(iii) $\frac{\lambda}{h}$ (iv) $h + \lambda$ (Score : 1)

4. Write down the truth table of a NOR gate. (Scores : 2)

5. (a) How many electrons constitute an electric charge of $-16 \mu\text{C}$?
(i) 10^{13} (ii) 10^{14}
(iii) 10^{15} (iv) 10^{12} (Score : 1)

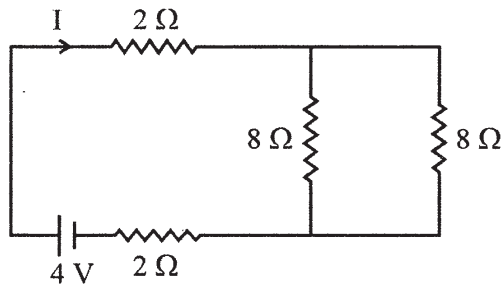
(b) An electric dipole is a pair of equal and opposite point charges $+q$ and $-q$ separated by a distance r . Write an expression for its dipole moment. (Score : 1)

(c) When an electric dipole is subjected to a uniform electric field, what will happen? (Score : 1)

6. A message signal of frequency 10 kHz and peak voltage 10 V is used to modulate a carrier of frequency 1 MHz and peak voltage 20 V. Find the modulation index. (Scores : 2)

7. (a) Resistivity of a conductor depends upon
(i) its material (ii) its cross-sectional area
(iii) its length (iv) All of the above (Score : 1)

- (b) Calculate the current flowing through the following circuit :



(Scores : 2)

- (c) A potentiometer is a device to measure emf of a cell. Explain how the emfs of two cells can be compared using a potentiometer.

(Scores : 3)

8. (a) Choose the wrong option.

- (i) Volt = Weber/second (ii) Weber = Henry \times Ampere
(iii) Joule = Henry \times Ampere² (iv) Volt = Weber \times Second (Score : 1)

- (b) The current in a coil of self inductance 0.1 H varies from 2A to 5A in a time of 1 ms. Find the induced emf across the coil. (Scores : 2)

9. (a) Sound waves do not exhibit _____.

- (i) interference (ii) diffraction
(iii) polarisation (iv) reflection (Score : 1)

- (b) Describe Young's double slit experiment to determine bandwidth of the interference pattern. (Scores : 4)

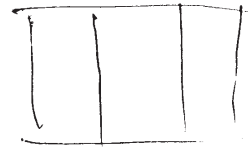
OR

- (a) The intensity of scattered light I in Rayleigh scattering is proportional to _____ (Score : 1)

- (b) Explain the diffraction pattern obtained due to a single slit and represent graphically the variation of intensity with angle of diffraction. (Scores : 4)

10. (a) Define half life period of a radioactive nucleus. Write down the relation connecting half life period and mean life. (Scores : 2)

- (b) Define 1 amu. Calculate its energy equivalent in MeV. (Scores : 2)



d

11. Photoelectric current does not depend on energy of the radiation, but on its intensity.
Explain. (Scores : 2)

12. (a) Speed of light in glass is 2×10^8 m/s. Refractive index of glass is _____. (Score : 1)

(b) For an equilateral prism made of a material of refractive index $\sqrt{2}$, find the angle of minimum deviation for a ray of monochromatic light. (Scores : 2)

(c) Draw the ray diagram of a simple microscope that uses a single convex lens. Derive an expression for its linear magnification. (Scores : 3)

13. (a) A dielectric slab is placed between the plates of a parallel plate capacitor. Its capacitance

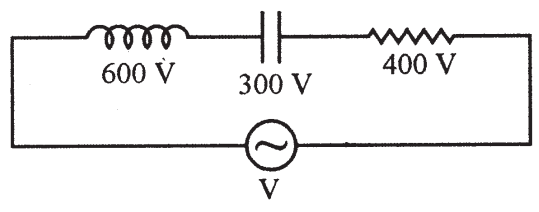
(i) becomes zero	(ii) remains the same	
(iii) decreases	(iv) increases	(Score : 1)

(b) Derive an expression for energy stored in a capacitor. (Scores : 4)

14. (a) At resonance, in an LCR circuit, the emf and current are

(i) in phase	
(ii) out of phase	
(iii) having a phase difference of $\pi/2$	
(iv) having a phase difference of $\pi/6$	(Score : 1)

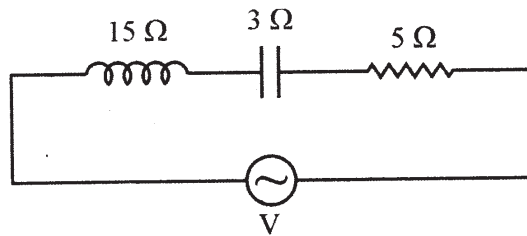
(b) In the following circuit, find the value of V.



(Scores : 2)

OR

- (a) In a circuit carrying an ideal coil with negligible resistance, the power dissipated is _____ . (Score : 1)
- (b) In the following circuit, find the impedance. (Scores : 2)



15. Explain hysteresis and draw hysteresis curve for a ferromagnetic substance. (Scores : 3)
16. Choose the appropriate values for X-rays from the given table. (Scores : 2)

Wave Length	Frequency
1 mm	3×10^{17} Hz
1 μ m	3×10^8 Hz
1 nm	3×10^{21} Hz

17. (a) Unit of wave number is _____ . (Score : 1)
- (i) Hz (ii) eV
- (iii) m (iv) m^{-1}
- (b) Energy of ground state of hydrogen atom is -13.6 eV. What is its ionisation potential ? (Scores : 2)
18. The current amplification factor for CB configuration of a transistor is 0.9. Find out the current amplification factor for CE configuration. (Scores : 3)

19. (a) An electric charge q is moving with a velocity v in the direction of a magnetic field B . The magnetic force acting on the charge is

(i) qvB

(ii) zero

(iii) $\frac{q}{vB}$

(iv) $\frac{v}{qB}$

(Score : 1)

(b) Starting from Biot-Savart law, obtain an expression for the magnetic field at an axial point of a circular coil carrying current. (Scores : 4)

OR

(a) An ammeter is a current measuring device which is always connected in _____ in an electric circuit. (Score : 1)

(b) Describe a cyclotron and obtain an expression for cyclotron frequency. (Scores : 4)