Reg. No. :

Name : ....

Code No. 5015

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 ചോദ്യനമ്പരിൽ 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 μC ?

(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 an uniform electric field, what will happen ? **(Score : 1)**

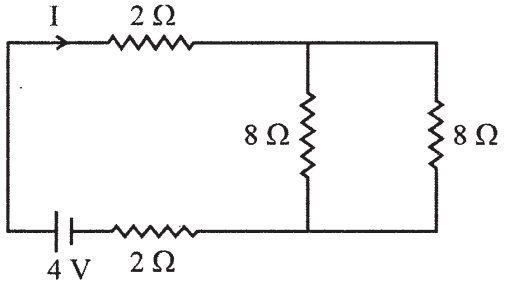
6. A message signal of frequency 10 kHz and peak voltage 10 V is used to modulate a carrier of frequency 1 MHz and peak voltage 20 V. Find the modulation index. **(Scores : 2)**

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 × Ampere

(iii) Joule = Henry × Ampere^2 (iv) Volt = Weber × 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)**

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

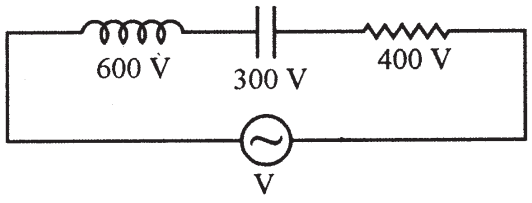
(i) in phase

(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.

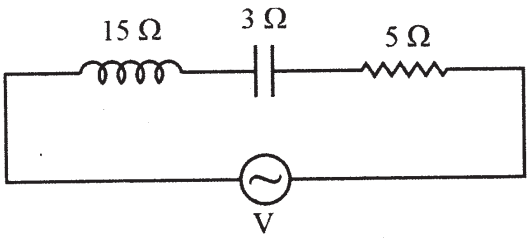


(Scores : 2)

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.

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

(Scores : 2)

17. (a) Unit of wave number is

(i) Hz (ii) eV

(iii) m (iv) m^{-1} **(Score : 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)**
