

B.Sc. DEGREE EXAMINATION APRIL 2016
BRANCH I – MATHEMATICS
SECOND SEMESTER

REG. No. _____

COURSE : ALLIED – CORE
PAPER : PHYSICS– II
TIME : 30 MINS.

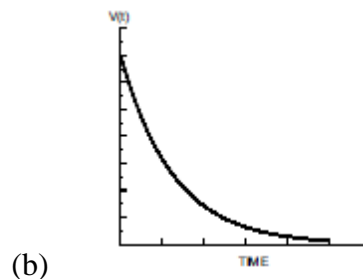
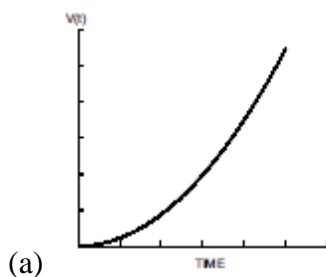
MAX. MARKS: 30

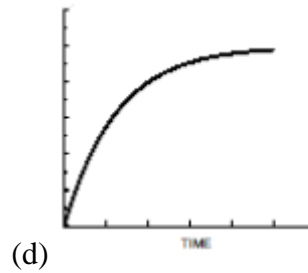
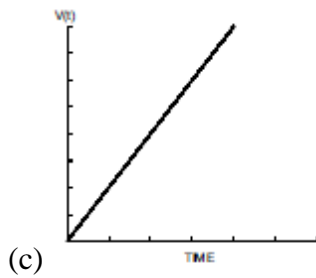
SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF
ANSWER ALL QUESTIONS: (30x1=30)

Choose the correct Answer:

1. A charge Q exerts a 12 N force on another charge q . If the distance between the charges is doubled, what is the magnitude of the force exerted on Q by q ?
(a) 3N (b) 6N (c) 24N (d) 36N
2. A parallel plate capacitor is formed from two square plates with area $A = 5000 \text{ cm}^2$, spaced $d = 1.0 \text{ mm}$ apart, as in the following figure. The gap between the plates is filled with air (dielectric constant $\kappa = 1$). What is the capacitance?
(a) $2.2 \times 10^{-7} \text{ F}$ (b) $4.4 \times 10^{-9} \text{ F}$ (c) $2.2 \times 10^{-9} \text{ F}$ (d) $4.4 \times 10^{-7} \text{ F}$
3. Which of the following graphs best represents the behavior of the potential difference across the capacitor as a function of time?





4. A positive charge moving with a constant velocity v enters a region of a uniform magnetic field pointing out the page. What is the direction of the magnetic force on the charge?
 (a) Left (b) Right
 (c) To the bottom of the page (d) There is no magnetic force on the current
5. A 300 mm long conductor is carrying a current of 10 A and is situated at right angles to a magnetic field having a flux density of 0.8 T ; the force on the conductor will be
 (a) 240N (b) 24N (c) 2.4N (d) .24N
6. In electromagnetic waves, the electric field \mathbf{E} and magnetic field \mathbf{B} have a phase difference as
 (a) $\pi/4$ (b) $\pi/2$ (c) π (d) zero
7. Polaroids are used to
 a) increase glare b) filter the entire light c) avoid glare d) to polarize output
8. Plane polarized light has vibrations
 a) in the plane of polarisation b) inclined at 30° to the plane of polarisation
 c) inclined at 45° to the plane of polarization d) normal to the plane of polarization
9. Constructive interference occurs, when the path difference is
 a) $\lambda/2$ b) zero c) $(2n+1)\lambda/2$ d) $n\lambda$
10. For normal adjustment, length of astronomical telescope is
 (a) $f_o + f_e$ (b) $f_o - f_e$ (c) f_o / f_e (d) f_e / f_o
11. The ability of an instrument to reveal the minor details of the object under the examinations is Called
 (a) magnifying power (b) Resolving power
 (c) Power of the lense (d) None of these
12. A convex and concave lens of focal length f are in contact the focal length of the combinations will be
 (a) Zero (b) $f/2$ (c) $2f$ (d) infinite
13. NOT gate is also called as _____
 (a) an inverter (b) a converter (c) rectifier (d) An universal gate

14. Output of logic gate is 1, when both the inputs are 1. Then it must be _____ gate.
 (a) AND (b) OR (c) NOT (d) NAND

15. One of De Morgan's theorems states that $X + Y = X \cdot Y$. Simply stated, this means that logically there is no difference between:

- (a) a NOR and an AND gate with inverted inputs
- (b) a NAND and an OR gate with inverted inputs
- (c) an AND and a NOR gate with inverted inputs
- (d) a NOR and a NAND gate with inverted inputs

Fill in the blanks:

- 16. For a charge 'q' outside the closed surface, the total normal electric flux Φ is _____.
- 17. The Boolean expression $AB(A + B)$ can be reduced to _____.
- 18. Diffraction explains _____ nature of light.
- 19. Lorentz force is given by _____.
- 20. If a monochromatic light is used, the centre of the Newton's rings is _____.

State whether true or false:

- 21. Principle of Polarisation is used in sun glasses.
- 22. The ordinary and extraordinary rays travel with the same velocity along optic axis.
- 23. The force experienced by a charged particle travelling along the direction of the magnetic field is zero.
- 24. A differential amplifier amplifies the difference between the two input Signals.
- 25. Electromagnetic equations are given by Einstein.

Answer briefly:

26. Give the relation between the potential and the field strength.

27. What are basic properties of Boolean algebra?

28. Differentiate between Fresnel and Fraunhofer diffraction.

29. Define CMRR of a differential amplifier?

30. List out uses of polaroids.



STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2015-16)

SUBJECT CODE: 15PH/AC/PH23

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SECTION – B

ANSWER ANY FIVE QUESTIONS: (5×5=25)

1. Determine the ratio of the electrostatic force to the gravitational force between a proton and an electron.
Note: $k = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$; $G = 6.672 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$; $m_e = 9.109 \times 10^{-31} \text{ kg}$; and $m_p = 1.672 \times 10^{-27} \text{ kg}$.
2. The plate of a parallel plate capacitor have an area of 90 cm^2 each and are separated by 2.5mm. Calculate the Capacitance.
3. Calculate the Lorentz force for a charged particle having a charge of $1.6 \times 10^{-9} \text{ C}$ kept in an electric field $40 \times 10^3 \text{ V/m}$ and in a magnetic field of 1.5 Wb / m^2 travelling with a velocity $2 \times 10^7 \text{ m/sec}$.
4. Calculate the angle of the first order maximum of a grating with 6×10^5 lines /metrefor a source of wavelength 5893 \AA .
5. Explain the construction and working of a Nicol prism.
6. Show how can an operational amplifier be used as an summing.
7. Prove the following Boolean theorems
(a) $(A + B)(A + B)$ (b) $AB + AC = (A + C)(A + B)$ (c) $A(A + B) = A$

SECTION – C

ANSWER ANY THREE QUESTIONS: (3×15 =45)

8. Define the term Capacitance. Obtain an expression for capacitance of parallel plate capacitor with and without dielectric.
9. Explain the construction and working of Radio Telescope.
10. How to determine wavelength of a given source of light by forming Newton's rings?
11. Derive an expression for force on a current carrying conductor in a uniform magnetic field.
12. Explain the working of an Op-Amp as (a) differentiator and (b) integrator



