

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12 & thereafter)

SUBJECT CODE : 11PH/AC/PM23

B.Sc. DEGREE EXAMINATION APRIL 2014
BRANCH I – MATHEMATICS
SECOND SEMESTER

REG. No. _____

COURSE : ALLIED – CORE
PAPER : PHYSICS FOR MATHEMATICS – 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:

- The force between two point charges depends on the
 - nature of the medium in which two charges are situated
 - product of the charges
 - square of the distance between them
 - all the above
- The capacitance of a parallel plate capacitor increases from $10\mu F$ to $120\mu F$ when a dielectric is filled between the plates. The dielectric constant of the plate is
 - 12
 - 10
 - 60
 - 20
- In magnetic Lorentz force, the force F on the charge is zero
 - if the motion of the charge is parallel to the field
 - if the motion of the charges is anti parallel to the field
 - if the charge is at rest
 - all the above
- The Maxwell's equation is _____
 - $\nabla \times E = -\frac{\partial B}{\partial t}$
 - $P = E \times H$
 - $F = q(\vec{v} \times \vec{B})$
 - $\nabla \times H = 0$
- If the current carrying conductor is placed perpendicular to the direction of the magnetic field, then the conductor experiences
 - minimum force
 - maximum force
 - zero
 - none of the above
- The telescope that uses a lens as an objective is called _____ telescope.
 - reflecting
 - constant deviation
 - refracting
 - power

7. In Newton's telescope, the objective is a large concave spherical mirror made of metal, an alloy of _____.
- a) copper, iron b) tin, iron c) copper, tin d) copper, silver
8. In Fresnel is diffraction the wave front undergoing diffraction pattern is
- a) spherical only b) cylindrical only
c) plane only d) either spherical or cylindrical
9. A point source inside a refracting crystal produces spherical wave front corresponding _____ ray.
- a) ordinary, extraordinary b) extra ordinary, ordinary
c) ordinary, ordinary d) extraordinary, extraordinary
10. Solar spectrum is an example of _____ spectrum.
- a) band absorption b) line absorption
c) continuous absorption d) line emission
11. _____ gates are basic logic gates.
- a) OR and AND b) AND and NOT
c) NAND, OR, NOT d) AND, OR and NOT
12. _____ gate is a gate with only one input and one output.
- a) OR b) NOT c) NAND d) AND
13. OP-AMP is a solid state device capable of sensing _____ input signals.
- a) dc b) ac c) dc and ac d) none of the above
14. Since the input impedance of an ideal operational amplifier is infinite.
- a) its output resistance is high
b) it becomes a current controlled
c) its input current is zero
d) its output voltage becomes independence of load resistance.
15. The following arrangement performs the function of _____ gate.
- O O
- a) OR b) EXOR c) NAND d) AND

Fill in the blanks:

16. When a current is passed through a coil suspended freely in a magnetic field, it experiences a force in a direction is given by _____.
17. The potential at a point due to a charge of $4 \times 10^{-7} \text{ C}$ located at 0.09 m away is _____.
18. The defects of coloured image formed by a lens with white light is called _____ aberration.
19. The logic symbol of OR gate is _____.
20. A diffraction pattern is obtained using a beam of red light. If the red light is replaced by blue light diffraction pattern becomes _____ and _____.

State whether TRUE/FALSE:

21. The total charge in an isolated system always remains constant.
22. The combined width of a ruling and opaque portion is called grating element.
23. The phenomena of reflection, refraction, interference and diffraction are common to both transverse waves and longitudinal waves.
24. In an inverting amplifier the output voltage is in phase with the input voltage.
25. Applying the rules of binary addition, the addition of 5 and 6 is 1011.

Answer briefly:

26. Define capacitance of a capacitor.

27. State Gauss's law.

28. Write any two advantages of reflecting telescope.

29. Why the centre of Newton's rings is dark?

30. Write the rules used to multiply two binary numbers.



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SECTION - B

ANSWER ANY FIVE QUESTIONS: (5×6=30)

1. A positive charge of $q_1 = 2 \times 10^{-7} C$ is placed at a distance of $0.15m$ from another positive charge of $q_2 = 8 \times 10^{-7} C$. At what point on the line joining them in the electric field is zero?
2. A parallel plate capacitor with air between the plates has a capacitance of $8 PF$. What will be the capacitance if the distance between the plates be reduced to half and the space between them is filled with a substance of dielectric constant 6.
3. Derive the relation between electric field and electric potential.
4. A plano-convex lens of radius $3m$ is placed on an optically flat glass plate and is illuminated by monochromatic light. The radius of the 8^{th} dark ring is $3.6 mm$. Calculate the wavelength of light used.
5. A parallel beam of monochromatic light is allowed to incident normally on a plane transmission grating having 5000 lines per centimeter. A second order spectral line is found to be diffracted at an angle 30° . Find the wavelength of the light.
6. Explain emission spectra.
7. Perform the following addition and multiplication in the binary number system.
a) $12 + 13$ b) 6×7

SECTION – C

ANSWER ANY TWO QUESTIONS: (2 × 20 = 40)

8. (i) Give the construction of moving coil ballistic galvanometer. Derive an expression between the quantity of charge flowing through it and the throw obtained.
(ii) Explain current and voltage sensitiveness of a moving coil galvanometer.

9. (i) What do you mean by spherical and chromatic aberration of a lens.
(ii) Find the condition of achromatism of a combination of two thin coaxial lenses
a) when it is in contact b) when separated by a distance
10. (i) What is meant by optical activity? Give the construction and working of
Laurent's half shade polarimeter.
(ii) Write the uses of polaroids.
11. (i) State and prove De Morgan's theorem.
(ii) Explain how operational amplifier is used as a summing device.

