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

B.Sc. DEGREE EXAMINATION APRIL 2012
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: **(30 x 1 = 30)**

I.   CHOOSE THE CORRECT ANSWER:

1.   When the distance between the two charged particles is halved, the force between
      them becomes
      a) one-fourth   b) one-half   c) zero   d) four times

2.   If e represents the charge of an electron and V the potential difference between two
      points, eV represents the magnitude of
      a) torque   b) momentum   c) energy   d) power

3.   S.I unit of electric flux is
      a) Nm^2/C b) N^2m/C c) NmC^2 d) Nm/C^2

4.   An infinitely long wire carries a current of 3A. The magnetic field outside the wire
      a) points radially away   b) points inward   c) circles the wire   d) zero

5.   The energy stored in a capacitor of capacity C and potential V is given by
      a) $1/2CV$ b) $1/2C^2V$ c) $1/2CV^2$ d) $1/2C^2 V^2$

6.   Chromatic aberration in a lens is caused by
      a) diffraction   b) diffusion   c) dispersion d) interference

7.   The number of rulings per unit length over the grating surface is increased, then
      the resolving power of the grating will
      a) Decrease   b) increase   c) remains unchanged   d) reduce to zero

8.   The phenomena which proves the transverse nature of light waves is
      a) reflection   b) interference   c) diffraction   d) polarization

9.   Light transmitted by a single Nicol crystal is
      a) plane polarized   b) unpolarised
      c) circularly polarized   d) elliptically polarised

10.   The useful magnifying power of a telescope should be
       a) 200   b) 20   c) 10   d) infinite

11.   Specified value of CMRR for 741 opamp is
       a) 20 dB   b) 40 dB   c) 30 dB   d) 90 dB

12.   The number 11001_2 is equivalent to decimal number
       a) fifteen   b) one thousand   c) twenty five   d) twenty

13.   The cumulative addition of four binary bits (1+1+1+1+1) gives
       a) 1111   b) 1001   c) 100   d) 001

14.   The result of the binary subtraction (100 – 011) is
       a) -111   b) 111   c) 011   d) 001

15.   For getting an output from AND gate both the inputs must be
        a) at the opposite logic level   b) low
        c) at the same logic level   d) high

II.   FILL IN THE BLANKS

16.   The unit of magnetic field is _____.

17.   When white light is incident on a thin film different colours are seen due to
       _____.

18.   Calcite crystal is a _____ crystal.

19.   When an input electrical signal A = 10100 is applied to a NOT gate its output
       signal is _____ .

20.   In Boolean algebra, the plus sign (+) indicates _____ operation.

III.   STATE TRUE OR FALSE

21.   An equipotential surface is that surface which has zero potential.

22.   Capacitance of a capacitor depends on the permittivity of the medium between
       its plates.

23.   Only coherent light sources produce sustained interference pattern.

24.   The operational amplifier amplifies the difference between the two input signals.

25.   The decimal equivalent of binary number 10110.0111 is 22.07.

IV.   **ANSWER IN BRIEF**

26.   Give the relation between electric potential and field.

27.   What do you mean by resolving power of an instrument?

28.   What is meant by double refraction?

29.   Draw the symbol of AND gate and give its truth table.

30.   Define CMRR.

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**SUBJECT CODE : 11PH/AC/PM23**

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COURSE : ALLIED – CORE
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TIME : 2 ½ HOURS   MAX. MARKS : 70
SECTION B

ANSWER ANY FIVE QUESTIONS: (5 × 6 = 30)

1. The area of each plate of a parallel plate capacitor is 4×10^{-2} m^2. If the thickness of the dielectric medium between the plates is 10^{-3} metre and the relative permittivity of the dielectric is 7, find the capacitance of the capacitor.   (6)

2. Give an account of Maxwell's equations in free space.   (6)

3. In a Newton's rings experiment the diameter of the 15th ring was found to be 0.590 cm and that of the 5th ring was 0.336 cm. If the radius of the plano convex lens is 100 cm, calculate the wavelength of light used.   (6)

4. Give the construction and working of a Nicol prism.   (3+3)

5. Perform the following
    a) $(107.6875)_{10} = (?)_2$ (2)
    b) $(1101) \times (1011) = ?$ (2)
    c) $(1010) \div (100) = ?$ (2)

6. Find the output of the following circuit.
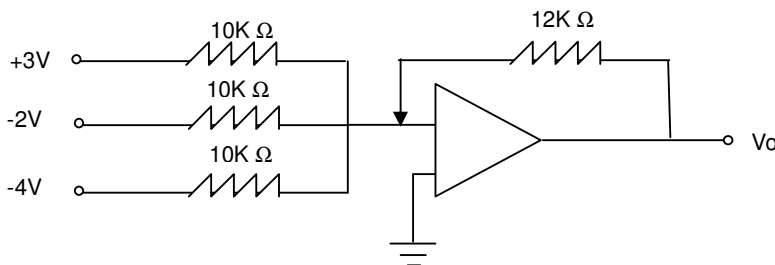
7. a) Define specific rotatory power.   (2)
   b) Determine the specific rotation of the given sample of sugar solution if the plane of polarization is turned through 13.2^0 . The length of the tube containing 10% sugar solution is 20 cm.   (4)

SECTION – C

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

8. a. Describe the construction and working of a B.G. (6+6)
    b. With a circuits explain how will you determine the charge sensitiveness of
       the galvanometer. (2+6)

9. a. Give the theory of a plane transmission grating and describe how it is used to
       determine the wave length of light. (6+6)
    b. What is spherical aberration? Give the methods of minimizing spherical
       aberration. (3+5)

10. a. Give the ideal characteristics of an operational amplifier and explain the
       working of a non inverting amplifier. (3+5)
    b. Explain how an op.Amp can be used as a
       (i) Subtractor (4)
       (ii) Integrator (4)
       (iii) Differentiator (4)

11. a. Derive an expression for the capacitance of a parallel plate capacitor. What will
       be the capacitance if the space between the plates is partially filled with a slab
       of thickness 'd' and relative permittivity 'ε_r'. (6+6)
    b. State and prove De Morgan's theorems with necessary circuits and truth tables.
       (4+4)

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