

# AUCET – 2009

Time: 75 Min

Max. marks: 90

1. The differential form of gauss law is [      ]  
a.  $\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}$       b.  $\nabla \cdot \mathbf{E} = \rho \epsilon_0$       c.  $\nabla \cdot \mathbf{E} = \frac{\epsilon_0}{\rho}$       d.  $\nabla \cdot \mathbf{E} = \rho + \epsilon_0$
2. If a pt charge q is placed at the centre of a cube what is a flux linked with each face of the cube? [      ]  
a.  $q/\epsilon_0$       b.  $q/2\epsilon_0$       c.  $q/4\epsilon_0$       d.  $q/6\epsilon_0$
3. How many electrons will have a charge of one coulomb [      ]  
a.  $6.2 \times 10^{18}$       b.  $6.2 \times 10^{19}$       c.  $5.2 \times 10^{18}$       d.  $5.2 \times 10^{19}$
4. A soap bubble is given a negative charge, then its radius [      ]  
a. Decreases      b. Increases      c. Remains unchanged      d. None of the above
5. A hollow metal sphere of radius 10 cm is charged such that the Potential on the surface is 80 V. The potential at the centre of the sphere is [      ]  
a. 800 V      b. zero      c. 8 V      d. 80 V
6. Energy stored in a capacitor is [      ]  
a.  $\frac{1}{2}cv$       b.  $\frac{1}{2}cv^2$       c.  $\frac{1}{2}qv^2$       d. qV
7. The capacitance of a parallel plate of area 'A' filled with a dielectric of constant 'K' is [      ]  
a.  $C = \frac{\epsilon_0 A}{kt}$       b.  $C = \frac{\epsilon_0 Ak}{t}$       c.  $\frac{Ak}{\epsilon_0 t}$       d.  $\frac{\epsilon_0 k}{At}$
8. A potential difference of 2 Volts is applied to a parallel plate capacitor of  $0.2 \mu F$  then it can store an energy of [      ]  
a.  $20 \times 10^{-6} \text{ Joules}$       b.  $4 \times 10^{-6} \text{ Joules}$       c.  $0.4 \times 10^{-6} \text{ Joules}$       d.  $0.4 \times 10^{-7} \text{ Joules}$
9. The electric Susceptibility is defined as the ratio b/w [      ]  
a. Electric displacement & Electric intensity  
b. Electric intensity & Electric displacement  
c. Electric intensity & dielectric polarization  
d. Dielectric polarization & Electric intensity in the dielectric
10. Capacitance of a spherical capacitor [      ]  
a.  $4\pi \epsilon_0 k \left[ \frac{ab}{a+b} \right]$       b.  $4\pi \epsilon_0 k \left[ \frac{ab}{b-a} \right]$       c.  $4\pi \epsilon_0 k \left[ \frac{a+b}{ab} \right]$       d.  $4\pi \epsilon_0 k \left[ \frac{a-b}{ab} \right]$
11. Dielectric constant of a material is 1.44 determine refractive index of that material? [      ]  
a. 1.2      b. 1.4      c. 1.22      d. 1.42
12. Dielectric material is placed between the two plates of a condenser potential between the plates will be [      ]  
a. decreases      b. increases      c. does not change      d. changes
13. A moving electric charge will produce [      ]  
a. Magnetic field only      b. Electric field only      c. Magnetic & Electric fields      d. No field
14. A charge particle enters at  $30^\circ$  to the magnetic field its path becomes [      ]  
a. Circular      b. Elliptical      c. Helical      d. Straight line

15. Find relation between B.H.I [      ]  
 a.  $B = \mu_0 H$                       b.  $B = \mu_0 I + H$                       c.  $B = \mu_0 (H + I)$                       d.  $B = \mu H$
16. Strength of the magnetic shell is 500 A, its thickness is 0.001 m find its intensity of magnetization [      ]  
 a.  $5 \times 10^5 \text{ Am}^{-1}$                       b.  $5 \text{ Am}^{-1}$                       c.  $5000 \text{ Am}^{-1}$                       d.  $500 \text{ Am}^{-1}$
17. Two parallel wires are carrying electric currents of equal magnetude and in the same direction. They exert [      ]  
 a. No force on each other                      b. An attractive force an each other  
 c. A repulsive force on each other                      d. A rotational torque on each other
18. An electric current is always accompanied by a magnetic field was discovered by [      ]  
 a. Fleming                      b. Ampere                      c. Oersted                      d. Newton
19. Hall effect gives information about [      ]  
 a. The dielectric constant of the material                      b. Sign of charge carriers in electric conductor  
 c. Thermal conductivity of the material                      d. Magnetic susceptibility of the material
20. A particle having charge q, mass m orbits perpendicularly to the uniform magnetic field 'B' what will be the cyclotron frequency [      ]  
 a.  $\frac{qB}{2\pi m}$                       b.  $\frac{2\pi m}{qB}$                       c.  $\frac{2\pi B}{qm}$                       d.  $\frac{qm}{2\pi B}$
21. The magnetic permeability of vacuum is SI unit is [      ]  
 a.  $\frac{10^7}{4\pi}$                       b.  $4\pi \times 10^{-7}$                       c.  $4\pi \times 10^7$                       d.  $\pi \times 10^{-7}$
22. The vector form of Biot Savart law is given by [      ]  
 a.  $dB = \frac{\mu_0}{4\pi} \times \frac{idl \times r}{r^3}$                       b.  $dB = \frac{4\pi}{\mu_0} \times \frac{idl \times r}{r^2}$                       c.  $dB = \frac{\mu_0}{4\pi} \times \frac{idl \times r}{r^2}$                       d.  $dB = \frac{\mu_0}{4\pi} \times \frac{idl \times r}{ir^2}$
23. Lenz's law is consequence of the law of conservation of [      ]  
 a. charge                      b. energy                      c. mass                      d. linear momentum
24. If  $\phi$  is the magnetic flux linked with a circuit at any instant 't' and ' $\rho$ ' is the induced emf then  $\rho \propto \left[ \frac{d\phi}{dt} \right]$  is [      ]  
 a. Ampere's law                      b. Lenz's law                      c. Biot-Savart law                      d. Faraday's law
25. An electron describes a circle of radius 2 cm if the speed of the electron is doubled the radius of the orbit will be [      ]  
 a. 0.5 cm                      b. 1 cm                      c. 2 cm                      d. 4 cm
26. Calculate the self inductance of a solenoid of length 1 m and area of cross section  $0.01 \text{ m}^2$  with 2000 [      ]  
 a. 0.05 Henry                      b. 5 Henry                      c. 0.5 Henry                      d. 0.005 Henry
27. The susceptibility of a paramagnetic material is [      ]  
 a.  $\chi \propto T$                       b.  $\chi \propto \frac{1}{T}$                       c.  $\chi \propto \frac{1}{\sqrt{T}}$                       d. does not depend on Temp
28. 1 Web/m<sup>2</sup> is equal to [      ]  
 a.  $10^4$  gauss                      b.  $10^{-4}$  gauss                      c.  $10^2$  gauss                      d.  $10^{-2}$  gauss
29. Two coils of inductance  $L_1$  and  $L_2$  these two placed closed to each other the mutual inductance of the pair is [      ]  
 a.  $L_1 L_2$                       b.  $(L_1 L_2)^2$                       c.  $\sqrt{L_1 L_2}$                       d. None
30. In Ballistic Galvanometer, the suspension wire is made with [      ]  
 a. Copper                      b. Nickel                      c. Manganin                      d. Phosphor-Brenze
31. In an a.c.circuit the power factor is [      ]

- a. sin of the phase angle  
c. tan of the phase angle

- b. cos of the phase angle  
d. secant of the phase angle

**Page - 3**

32. In L-R dc circuit the time constant is [      ]  
a. LR                                      b. R/L                                      c. Zero                                      d. L/R
33. During parallel resonance this is minimum [      ]  
a. Voltage                                      b. Current                                      c. Impedence                                      d. Resistance
34. The phase angle between current and voltage in a purely inductive circuit is [      ]  
a. 0                                      b.  $\pi$                                       c.  $\pi/2$                                       d.  $-\pi/2$
35. The pointing vector  $\vec{p}$  is represented by [      ]  
a.  $E \times B$                                       b.  $\mu_0(E \times B)$                                       c.  $\frac{1}{\mu_0}(E \times B)$                                       d.  $B \times E$
36. For rectifying action we use [      ]  
a. Transformer                                      b. Diode                                      c. Transistor                                      d. Choke
37. The Ripple factor of a Half wave rectifier [      ]  
a. 1.21                                      b. 0.48                                      c. 1.44                                      d. 1.72
38. The conversion of D.C. to A.C. is performed by [      ]  
a. Amplifier                                      b. Oscillator                                      c. Rectifier                                      d. Detector
39. Convert  $(1101)_2$  to decimal [      ]  
a. 12                                      b. 13                                      c. 15                                      d. 9
40. Give truth table shown which gate [      ]

A	B	y
1	1	0
1	0	1
0	1	1
0	0	1

- a. NAND                                      b. AND                                      c. XOR                                      d. OR
41. If  $\eta$  is the coefficient of viscosity of a gas and 'T' is the absolute temp. [      ]  
a.  $\eta \propto \sqrt{T}$                                       b.  $\eta \propto T$                                       c.  $\eta \propto \frac{1}{T}$                                       d.  $\eta$  is independent of T
42. The ratio of average speed, root mean square speed and most probable speed of molecules [      ]  
a. 1.41: 1.73:1.59                                      b. 1.41:1.59:1.73                                      c. 1.59:1.73:1.41                                      d. 1.73:1.59:1.41
43. The zeroth law of thermodynamics was first enamiated by [      ]  
a. Kelvin                                      b. Plank                                      c. Fowler                                      d. Calusius
44. A reversible engine is working between two temp.  $327^\circ\text{C}$  and  $27^\circ\text{C}$  its efficiency is [      ]  
a. 75%                                      b. 50%                                      c. 100%                                      d. 30%
45. In terms of entrophy second law of thermodynamics can be represented as [      ]  
a.  $dQ = Tds$                                       b.  $dS = TdQ$                                       c.  $dS = T/dQ$                                       d.  $T = dS - dQ$
46. What is the change in entropy of a system consisting of 1 kg of ice at  $0^\circ\text{C}$ . Which melts water at the same temp. [ $L_{\text{ice}} = 0.336 \times 10^6 \text{ J/kg}$ ] [      ]  
a. 610 J/K                                      b. 1000 J/K                                      c. 1100 J/K                                      d. 1220 J/K
47. The clausiues-clapeyron's equation is [      ]

$$a. \frac{dp}{dT} = \frac{L(V_2 - V_1)}{T}$$

$$b. \frac{dp}{dV} = \frac{L(T_2 - T_1)}{V}$$

$$c. \frac{dp}{dV} = \frac{L}{V(T_2 - T_1)}$$

$$d. \frac{dp}{dV} = \frac{L}{T(V_2 - V_1)}$$

#### Page - 4

48. The expression for joule Thomson Cooling is [ ]
- a.  $dT = \left( \frac{2a}{RT} - b \right)$  b.  $dT = \frac{p_1 - p_2}{C_p J} \left( \frac{2a}{RT} - b \right)$
- c.  $dT = p_1 - p_2 \left( \frac{2a}{RT} - b \right)$  d.  $dT = \frac{C_p p_1 - p_2}{J} \left( \frac{2a}{RT} - b \right)$
49. The process of Joule-Kelvin expansion is essentially [ ]
- a. An isothermal process b. An adiabatic process
- c. An isoentholphy process d. An isobaric process
50. A refregirator is [ ]
- a. Heat engine b. An electric motor c. Heat engine working backward d. Air cooler
51. Pyroheliometer is used for [ ]
- a. To determine low temp. b. To determine high temp.
- c. To determine solar constant d. To determine Absorbic power
52. The expression for wien's constant as derived from plank's formula is [ ]
- a.  $hc/4.965k$  b.  $hk/4.965c$  c.  $kc/4.965h$  d.  $4.965k/hc$
53. If the slit width is equal to twice the wavelength of light used, the angle of diffraction  $\theta$  at which the first minimum occurs is [ ]
- a.  $30^\circ$  b.  $45^\circ$  c.  $60^\circ$  d.  $90^\circ$
54. The expression for most probable distribution in Fermi-dirac distribution is [ ]
- a.  $n_i = \frac{g_i}{\rho^{(\alpha + \epsilon_i / KT)}}$  b.  $n_i = \frac{g_i}{\rho^{(\alpha + \epsilon_i / KT)} - 1}$  c.  $n_i = \frac{g_i}{\rho^{(\alpha + \epsilon_i / KT)} + 1}$  d. None of the above
55. The example of Bosens are [ ]
- a. Electron b. Proton c. Photons d. Neutrons
56. The refraction matrix for a refractive surface is given by  $\begin{bmatrix} 1 & -8.5 \\ 0 & 1 \end{bmatrix}$ . The refracting power of the surface is [ ]
- a. 7.5 b. 8.5 c. 0.5 d. 1
57. The determinant of a system matrix is [ ]
- a. 0 b. -1 c. 0.5 d. 1
58. Two thin lenses of focal length 16 cm and 12 cm form a combination which is corrected for spherical aberration the focal length the focal length of the combination is [ ]
- a. 4 cm b. 8 cm c. 14 cm d. 12 cm
59. The condition for minimization of chromate aberration in a system of two thin lenses of focal lengths  $f_1$  and  $f_2$  and dispersive powers  $w_1$  and  $w_2$  is [ ]
- a.  $\frac{f_1}{f_2} = \frac{-w_1}{w_2}$  b.  $\frac{f_1}{f_2} = \frac{w_1}{w_2}$  c.  $\frac{f_1}{f_2} = \frac{w_2}{w_1}$  d.  $\frac{f_1}{f_2} = \frac{-w_2}{w_1}$
60. Two coherent light sources whose intensity ratio 81: 1 produce interference fringes . Obtain the ratio of maximum to minimum intensity in the interference pattern [ ]
- a. 9 : 4 b. 25 : 16 c. 2 : 1 d. 5 : 3
61. When a soap film on water is observed in day light, if exhibit beautiful colours due to [ ]
- a. Interference b. Dispersion c. Polarisation d. Diffraction
62. In the case of Newtons rings by reflected light, the diameter (D) of the bright ring is proportional to [ ]
- a.  $D \propto \sqrt{n}$  b.  $D \propto (2n - 1)$  c.  $D \propto \sqrt{2n - 1}$  d.  $D \propto n$

63. The expression for resolving power of a grating with element  $(e + d)$  is [      ]  
 a.  $\frac{\lambda}{d\lambda} = \frac{N \sin \theta_n}{\lambda}$     b.  $\frac{\lambda}{d\lambda} = \frac{N(e+d) \sin \theta_n}{\lambda}$     c.  $\frac{\lambda}{d\lambda} = \frac{(e+d) \sin \theta_n}{\lambda}$     d.  $\frac{\lambda}{d\lambda} = \frac{N \sin \theta_n}{(e+d)\lambda}$

**Page - 5**

64. The focal length of a zone plate is given by [      ]  
 a.  $f_n = \frac{nr_n^2}{\lambda}$     b.  $f_n = \frac{n\lambda}{r_n^2}$     c.  $f_n = \frac{\lambda}{nr_n^2}$     d.  $f_n = \frac{r_n^2}{n\lambda}$
65. In Fresnel's diffraction [      ]  
 a. Source is at an infinite distance    b. Screen is at infinite distance  
 c. Source and screen is at infinite distance    d. Source and screen are at finite distance
66. The phenomenon which confirms that the light waves are transverse waves [      ]  
 a. Interference    b. Diffraction    c. Polarisation    d. Double refraction
67. For quartz  $\mu_0 = 1.553$  and  $\mu_0 = 1.533$  for  $\lambda = 4000 \text{ \AA}$ . The thickness of half wave plate should be [      ]  
 a.  $0.5 \times 10^{-4} \text{ cm}$     b.  $1 \text{ cm}$     c.  $0.1 \text{ cm}$     d.  $1 \times 10^{-3} \text{ cm}$
68. A calcite crystal is a [      ]  
 a. Uniaxial crystal    b. Biaxial crystal    c. Opaque crystal    d. Polaroid
69. Active material in the Ruby Rod is [      ]  
 a. Al ions    b. Cr ions    c. Ba ions    d. None
70. Optical fibres are based on the principle [      ]  
 a. Reflection    b. Refraction    c. Total internal reflection    d. None
71. If  $\vec{r}$  is the position vector of a point, then  $\nabla \cdot \vec{r}$  is given by [      ]  
 a. 1    b. 2    c. 3    d. 4
72. Angle between two vectors  $\vec{A} = 4i + 4j + 4k$ ,  $\vec{B} = 2i + 2j - 4k$  [      ]  
 a.  $60^\circ$     b.  $0^\circ$     c.  $90^\circ$     d.  $180^\circ$
73. The coefficient of restitution 'e' for a perfectly inelastic collision is [      ]  
 a. 1    b. 0    c.  $\infty$     d. -1
74. Rutherford's scattering cross section is proportional to [      ]  
 a. Square of the mass of the particle  $\alpha$     b. Square of the atomic number of the Nucleus  
 c. Square of the velocity of the  $\alpha$  - particle    d. Square of the scattering angle
75. A rocket burns 0.02 kg of fuel per second ejecting it as a gas with a velocity of 10,000m/sec what force does the gas exert on the rocket [      ]  
 a. 300 N    b. 200 N    c. 100 N    d. 400 N
76. If R and T are the radius of the orbit and period of revolution for a planet respectively. Then according to the Kepler's third law [      ]  
 a.  $T^3 \propto R^3$     b.  $T^2 \propto R^3$     c.  $T^3 \propto R^{-2}$     d.  $T^2 \propto R^{-3}$
77. The Lorentz transformation for space is given by [      ]  
 a.  $x^1 = \frac{x - vt}{\sqrt{1 - v^2/c^2}}$     b.  $x^1 = \frac{x + vt}{\sqrt{1 - v^2/c^2}}$     c.  $x^1 = \frac{x - vt}{\sqrt{1 - v^2}}$     d.  $x^1 = \frac{x + vt}{\sqrt{1 - c^2}}$
78. In the case of central force which is conservative ? [      ]  
 a. Energy    b. Angular momentum    c. Linear momentum    d. None
79. Poisson ratio  $\sigma =$  [      ]  
 a.  $\frac{Y}{2n-1}$     b.  $\frac{Y}{2n} - 1$     c.  $\frac{2Y}{\eta} - 1$     d. None

80. According to Hooke's law in elasticity the ratio of stress and strain [      ]  
a. Not constant                      b. Constant                      c. Increases                      d. Decreases

**Page - 6**

81. Beats are the results of [      ]  
a. Diffraction  
b. Destructive Interference  
c. Constructive Interference  
d. Super position of two waves nearly equal frequencies
82. A simple harmonic oscillator of mass 'm' executes oscillations of amplitude 'a' and frequency 'n'. The total energy of the oscillator is given by [      ]  
a.  $E = \frac{1}{2}ma^2n^2$                       b.  $E = 2\pi^2a^2m$                       c.  $E = 2\pi^2a^2nm$                       d.  $E = 2\pi^2a^2n^2m$
83. The resultant two simple harmonic motion  $y_1 = 3 \sin 314 t$  and  $y_2 = 4 \sin 314 t$  has the Amplitude [      ]  
a. 3 units                      b. 4 units                      c. 5 units                      d. 7 units
84. The Q factor of an oscillator is 20. The factor by which the energy decreases in each cycle is [      ]  
a. 0.5                      b. 0.3                      c. 0.7                      d. 0.2
85. The frequencies and amplitudes of the components of a saw tooth wave are respectively in the ratios [      ]  
a.  $1:2:3:....; 1:\frac{1}{2}:\frac{1}{3};$                       b.  $1:3:5:....; 1:\frac{1}{3}:\frac{1}{5};$   
c.  $1:3:5:....; 1:\frac{1}{3^2}:\frac{1}{5^2};$                       d.  $1:2:4:....; 1:\frac{1}{2}:\frac{1}{4};$
86. The displacement of a particle in SHM is given by  $y = 5 \sin 314 t$ , its frequency in Hz [      ]  
a. 0.5                      b. 5                      c. 50                      d. 500
87. The velocity of a transverse wave along a stretched string is [      ]  
a.  $\sqrt{\frac{F}{M}}$                       b.  $\sqrt{\frac{m}{t}}$                       c.  $\sqrt{\frac{l}{mT}}$                       d.  $\sqrt{\frac{T}{m}}$
88. In a stretched string the wave motion is expressed as  $y = 8 \sin \pi (0.02x - 4t)$ . The velocity of the wave [      ]  
a. 50 units                      b. 100 units                      c. 150 units                      d. 200 units
89. The crystal which produces ultrasonic waves by piezo electric effect [      ]  
a. Diamond                      b. Silicon                      c. Germanium                      d. Quartz
90. Sound waves with frequencies less than 20 Hz are [      ]  
a. Ultra sonics                      b. Infra sonics                      c. Audiable waves                      d. Gravity waves