VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – IV : Skill Based Subject : Sixth Semester : Paper–II

PHYSICS FOR COMPETITIVE EXAM.
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(75 × 1 = 75)**

1. The dimensions of a couple is
   a) ML^2T^{-2} b) MLT^{-2} c) $ML^{-1}T^{-3}$ d) $ML^{-2}T^{-2}$
2. The unit of G in SI system is
   a) $Nm^{-2}kg^{-2}$ b) $Nm^{-2}s^{-2}$ c) Nms^{-2} d) Nm^2kg^{-2}
3. The SI unit of universal gas constant (R) is
   a) $JK^{-1}mol^{-1}$ b) $NK^{-1}mol^{-1}$ c) $Watt\,K^{-1}mol^{-1}$ d) $erg\,K^{-1}mol^{-1}$
4. The dimensional formula for Planck's constant (h) is
   a) $\left[ML^2T^{-3}\right]$ b) $\left[ML^2T^{-2}\right]$ c) $\left[ML^2T^{-1}\right]$ d) $\left[ML^{-2}T^{-2}\right]$
5. Newton's first law of motion gives the concept of
   a) energy b) work c) inertia d) momentum
6. A canon after firing recoils due to
   a) conservation of energy b) backward thrust of gases produced
   c) Newton's third law of motion d) Newton's first law of motion
7. A rocket or jet engine works on the principle of
   a) conservation of linear momentum
   b) conservation of angular momentum
   c) conservation of energy d) conservation of mass
8. Two bodies of mass 1 kg *and* 4 kg are moving with equal kinetic energies. The ratio of their linear momentum is
   a) 1:2 b) 2:1 c) 4:1 d) 1:4
9. The period of the pendulum is doubled when
   a) its length is doubled b) the mass of the bob is doubled
   c) its length is made 4 times
   d) the mass of bob and the length of the pendulum are doubled

10. A loaded spring vibrates with a period T. The spring is now divided into nine equal parts and the same load is suspended from one of these parts. The new period is
    a) $T/3$ b) $T/9$ c) $3T$ d) T

11. The equivalence of two systems in thermal equilibrium is represented by the property
    a) temperature b) heat c) specific heat d) energy

12. An ideal gas heat engine operates in a Carnot cycle between $227^{o}C$ and $127^{o}C$. It absorbs 6×10^4 cals at the higher temperature. The amount of heat converted into work is equal to
    a) 4.8×10^4 cals b) 3.5×10^4 cals
    c) 1.6×10^4 cals d) 1.2×10^4 cals

13. The area under the curve on P-V diagram represents
    a) work done on or by the system b) work done in a cyclic process
    c) the thermodynamic process d) the condition of the system

14. A perfect gas is compressed to ¼ th of its original volume. The initial pressure of the gas is 1 atm. If the compression is isothermal, the final pressure will be
    a) 4 atm b) ¼ atm c) 16 atm d) $1/16$ atm

15. The freezer in a refrigerator is located in the top section so that
    a) the entire chamber of the refrigerator is cooled quickly
    b) motor is not heated
    c) heat gained from environment is less
    d) heat gained from environment is more

16. The radiation emitted by a perfectly black body is proportional to
    a) temperature on the ideal gas scale
    b) fourth root of temperature on ideal gas scale
    c) fourth power of temperature on ideal gas scale
    d) source of temperature on ideal gas scale

17. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarization is
    a) 0° b) 45° c) 90° d) 180°

18. Quantum nature of light is not supported by the phenomenon of
    a) Compton effect b) photoelectric effect
    c) emission or absorption spectrum d) interference of light waves

19. The energy and momentum of a photon are given by E=hν and P=h/λ respectively. Velocity of the photon will be
    a) EP b) E/P c) P/E d) E/P^2

20. The frequency of a light wave is 6.4×10^{14} Hz. Its energy in eV will be ($h = 6.6 \times 10^{-34}$ J-sec)
    a) 5.28 eV b) 3.96 eV c) 2.64 eV d) 1.32 eV

21. When a soap film (or oil film) on water is observed in daylight, it exhibits beautiful colours due to
    a) interference b) dispersion c) reflection d) refraction

22. In Young's two slits interference experiment if the distance between the silts is made 3 fold, the fringe width becomes
    a) 1/3 fold b) 2 fold c) 1/9 fold d) 9 fold

23. Hardness of magnetic material is measured by the value of
    a) magnetic induction b) intensity of magnetisation
    c) density of magnetic material d) coercive force

24. Curie temperature is that temperature at which the ferromagnetic material
    a) has maximum susceptibility b) has zero susceptibility
    c) loses its ferromagnetism d) develops reverse polarity

25. A circular coil of radius 4 cm having 50 turns carries a current of 2A. It is placed in uniform magnetic field of 0.1 wb/m^2. The work done to rotate the coil from equilibrium position by 180° is
    a) 0.1 J b) 0.2 J c) 0.4 J d) 0.8 J

26. F_g and F_e represent the gravitational and electrostatic forces respectively between electrons situated at some distance. The ratio of F_g/F_e is of the order of
    a) 1 b) 10 c) 10^{-43} d) 10^{-37}

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

28. A diople of electric dipole moment P is placed in a uniform electric field of strength E. If θ is the angle between positive directions of P and E, then the potential energy of the electric dipole is largest when θ is
    a) zero b) π/2 c) π d) π/4

29. Electric potential due to a point charge and a dipole respectively are directly proportional to
    a) r^{-1}, r^{-2} b) r^{1}, r^{-1} c) r^{-2}, r^{-3} d) r^{-2}, r^{-2}

30. The velocity of an electron which passes through a potential difference of 1000 volts is
    a) 1.87×10^7 m/s b) 18.7×10^7 m/s
    c) 0.187×10^7 m/s d) 187×10^7 m/s
31. A condenser is charged through a potential difference of 200 volts and possesses a charge of 0.1 Coulomb. When discharged it would release an energy of
    a) 1 J b) 2 J c) 10 J d) 20 J
32. Three condensers of capacitances 10, 20 and 30 μF are first connected in series and then connected in parallel. The ratio of the resultant capacitances in the two cases is
    a) 1 : 11 b) 11 : 1 c) 1 : 6 d) 6 : 1
33. The capacity of a parallel plate capacitor is 4 μF. The distance between the plates is doubled. The new capacity is
    a) 8 μF b) 4 μF c) 2 μF d) 1 μF
34. The effective resistance of three resistances 2 Ω, 4 Ω and 6 Ω connected in parallel is
    a) 12/11 Ω b) 11/12 Ω c) 12 Ω d) 0 Ω
35. n similar resistors each of resistance r when connected in parallel has the total resistance R. When these resistances are connected in series, the total resistance will be
    a) n^2R b) nR c) R/n d) R/n^2
36. Two free parallel wires carrying currents in the opposite direction
    a) attract each other
    b) repel each other
    c) do not affect each other
    d) get rotated to be perpendicular to each other
37. The current in an inductor is reduced to half. The energy stored in it
    a) is doubled b) reduces to one-fourth of its initial value
    c) remains unchanged d) reduces to half of its initial value
38. The velocity of certain ions that pass undeflected through crossed E and B fields for which E = 7.7 kV/m and B = 0.14 T
    a) 22 km/s b) 33 km/s c) 44 km/s d) 55 km/s
39. A coil of 20 turns has an area of 800 mm^2 and bears a current of 0.5 A. It is placed with its plane parallel to a magnetic field of intensity 0.3 T. The torque on the coil is
    a) 2.4×10^{-1} N-m b) 2.4×10^{-2} N-m
    c) 2.4×10^{-3} N-m d) 2.4×10^{-4} N-m

40. In a potentiometer, the length of its wire is doubled. The accuracy in determining the null point will
    a) decrease b) increase
    c) remain unchanged d) none of the above
41. When different parts of a metal are kept at different temperatures and current is passed through it, the heat is either evolved or absorbed. The effect is called
    a) Peltier effect b) Seebeck effect
    c) Thomson effect d) none of the above
42. A straight line conductor of length 0.4 m is moved with a speed of 7 m/s perpendicular to a magnetic field of intensity 0.9 wb/m^2. The induced e.m.f. across the conductor is
    a) 5.04 V b) 1.26 V c) 2.52 V d) 25.2 V
43. Which of the following phenomena is utilised in the construction of the mouth-piece of a telephone?
    a) electromagnetic induction b) heating effect of electric current
    c) change of resistance with temperature d) none of the above
44. To step up the voltage, the number of turns in the secondary should be
    a) less than the number of turns in the primary
    b) greater than the number of turns in the primary
    c) equal to the number of turns in the primary
    d) infinite
45. Core of a transformer is made of soft iron and laminated to
    a) reduce the heat loss b) reduce the eddy current loss
    c) reduce circuit permeability d) make assembly cheap and convenient
46. Reactance offered by a coil having no resistance in an a.c. circuit is equal to
    a) ωL b) $1/\omega L$ c) $\omega^2 L^2$ d) ωLR
47. An inductance of 0.4 Henry and a resistance of 100 Ω are connected in series with an A. C. supply of 220 volts, 50 c.p.s. Phase lag of current from e.m.f. applies is
    a) $\tan^{-1}(0.4\pi)$ b) $\tan^{-1}(\pi)$ c) $\tan^{-1}(4\pi)$ d) $\tan^{-1}(0.2\pi)$
48. A student has a coil of 3 mH and wishes to construct a circuit whose resonant frequency is 1000 kHz. The value of capacitor he must use is about (pico=10^{-12})
    a) 8.5 pico farad b) 0.8 pico farad
    c) 85 pico farad d) 850 pico farad

49. In an LCR-series circuit R= $\sqrt{3}\ \Omega$, $X_L = 10\ \Omega$, $X_C = 11\ \Omega$, the applied voltage is 10 Volt (R.M.S). The impedance of the circuit is
a) 8 Ω b) 4 Ω c) 2 Ω d) 1 Ω

50. If E_{rms}, be the R.M.S value of e.m.f, then its peak-to-peak value is given by
a) $E_{rms}/\sqrt{2}$ b) $\sqrt{2}\ E_{rms}$ c) $2\sqrt{2}\ E_{rms}$ d) $E_{rms}/2$

51. The electron beam with velocities in the ratio 1:2 is subjected to identical magnetic fields at right angles to them. The ratio of the deflections produced will be
a) 1 : 2 b) 2 : 1 c) 1 : 4 d) 4 : 1

52. If elements with principal quantum number n > 4 were not allowed in nature, the number of possible elements would be
a) 60 b) 32 c) 4 d) 64

53. A proton, deuteron, and an α – particle are accelerated by the same potential difference. Their velocities will be in the ratio of
a) 1:1:1 b) $\sqrt{2}$:1:1 c) 1:1:$\sqrt{2}$ d) 1:$\sqrt{2}$:1

54. "There are discrete energy levels in atoms and molecules" was first demonstrated experimentally by
a) Frank Hertz experiment
b) Rutherford alpha scattering experiment
d) Davisson and Germer's experiment
d) G.P. Thomson's experiment

55. The intensity of X-rays depends upon
a) kinetic energy of the electron striking the target
b) number of electrons striking the target
c) total momentum of the electron
d) none of the above

56. The velocity of the photoelectrons depends upon
a) frequency of the incident photon only
b) intensity of the incident photon only
c) intensity as well as frequency of the incident photon
d) none of the above

57. Light of two different frequencies, whose photons have energies 1 eV and 2.5 eV respectively, successively illuminate a metal whose work function is 0.5 eV. The ratio of the maximum speeds of the emitted electrons will be
a) 1 : 5 b) 1 : 4 c) 1 : 2 d) 1 : 1

58. Wave nature of matter is not apparent to our daily observations because
a) wavelength of the waves associated with the pretty heavy masses is very small
b) wavelength of the waves associated with the pretty heavy masses is very large
c) bodies travel with very large velocities d) none of the above

59. The de Broglie wavelength (λ) of a particle of mass *m* and charge *e*, accelerated by a potential V is given by
a) $\sqrt{2hmVe}$ b) $h/\sqrt{2mVe}$ c) $h\sqrt{2mVe}$ d) $\frac{\sqrt{2mV}}{eh}$

60. If the de Broglie wavelengths of an alpha particle and neutron are the same, then the velocity of
a) alpha particle is greater than that of neutron
b) neutron is greater than that of alpha particle
c) both neutron and alpha particle is same
d) none of the above

61. The uncertainty principle is applicable only when
a) position is measured after the momentum
b) momentum is measured after the position
c) position and momentum are measured simultaneously
d) none of the above

62. A spaceship 50 m long was to pass the earth travelling at 2.5×10^8 m/sec. Assuming a Lortenz-Fitzgerlad contraction, its apparent length will be
a) 3 m b) 30 m c) 300 m d) 0.3 m

63. Which of the following is not a mode of radioactive decay?
a) positron emission b) electron capture
c) fusion d) alpha decay

64. Nuclear force exist between
a) proton-proton b) neutron-neutron
c) neutron-proton d) all of the above

65. The phenomenon of nuclear fission to a certain extent can be easily explained by
a) liquid drop model b) shell model
c) collective model d) central force field model

66. Atomic power station at Tarapur has a generating capacity of 200 MW. The energy generated in a day by this station is
    a) 200 MW b) 200 Joules
    c) 4800×10^6 Joules d) 1728×10^{10} Joules
67. With increase in temperature, the electrical conductivity of intrinsic semi-conductor
    a) increases b) decreases
    c) first decreases and then increases
    d) first increases and then decreases
68. Fermi energy is
    a) the minimum energy possessed by an electron at 0 K
    b) the maximum energy possessed by an electron at 273 K
    c) the maximum energy possessed by an electron at 0 K
    d) the minimum energy possessed by an electron at 273 K
69. One prefers to use a transistor as common emitter amplifier, because
    a) the current gain is very large and hence the power gain increases
    b) the current gain is small
    c) it is more safe to operate d) none of the above
70. A bridge rectifier is preferred to an ordinary two-diode full wave rectifier because
    a) it has four diodes b) it has higher safety factor
    c) its transfer has no centre tap
    d) it needs much smaller transformer for the same output
71. The three axes of a crystal lattice are mutually perpendicular and two of the lattice parameters are equal. The crystal system is
    a) tetragonal b) trigonal c) rhombohedral d) cubic
72. In a simple cubic lattice $d_{100} : d_{110} : d_{111}$ is
    a) $\sqrt{6} : \sqrt{3} : \sqrt{2}$ b) 6 : 3: 2 c) $6 : 3 : \sqrt{2}$ d) $\sqrt{6} : \sqrt{3} : \sqrt{4}$
73. Stars radiate light of their own because of
    a) fission reactions b) chemical reactions
    c) mechanical contractions d) fusion reactions
74. The binary code of $(21.25)_{10}$ is
    a) 10100.001 b) 10101.001 c) 10101.010 d) 10100.100
75. NAND and NOR gates are called universal gates primarily because they
    a) are widely used in IC packages b) are easier to manufacture
    c) can be combined to produce OR, AND and NOT gates
    d) none of the above

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B.Sc. (Maths / Chem.) Degree (Semester) Examinations, April 2017
Part – III : Allied Subject : Second Semester : Paper – II

PHYSICS – II
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. When a light wave is reflected from the surface of an optically denser medium,it suffers a phase change of _____.
   a) $\pi/2$ b) π c) 2π d) 3π
2. The magnetic moment due to electron spin is equal to _____ Bohr magneton.
   a) one b) twice c) thrice d) half
3. The atomic mass unit is _____ of the mass of the neutral Carbon C-12 atom.
   a) $1/5$ b) $1/10$ c) $1/12$ d) $1/20$
4. One of the postulates of special theory of relativity is _____.
   a) speed of light is relative
   b) speed of light is same in all inertial frames
   c) time is relative d) mass is relative
5. _____ gate is having only one input and one output.
   a) AND b) OR c) NOT d) NOR
6. Crystals which possess only one optic axis are called _____.
7. The total number of electrons required to complete M –shell is _____.
8. When the B-E is large, the nucleus is said to be _____.
9. Einstein's mass-energy relation is _____.
10. According to Boolean Algebra, A.A is _____.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) Differentiate between Interference and Diffraction.

(OR)

b) A $200\ mm$ long tube and containing $48\ cm^3$ of sugar solution produces an optical rotation of 11^o when placed in a saccharimeter. If the specific rotation of sugar is 66^o, calculate the quantity of sugar contained in the tube in the form of a solution.

12. a) Explain the different quantum numbers associated with vector atom model.

(OR)

b) The experimental value of Bohr magneton is 9.21×10^{-24} *SI* units and Planck's constant $h = 6.6\times10^{-34}$ *Joule* - second. Calculate the value of e/m of an electron.

13. a) Describe the construction and working of an Ionisation chamber.

(OR)

b) Calculate the binding energy per nucleon in ${}_6C^{12}$. Masses of proton, neutron and electron are $1.007276,\ 1.008665$ *and* $0.00055u$ respectively. The mass of ${}_6C^{12}$ atom is $12.000000u$.

14. a) Derive Lorentz transformation equations.

(OR)

b) A rod of 1 meter long is moving along its length with a velocity of $0.6\ c$. Calculate its length as it appears to an observer

a) on the earth b) moving with the rod itself.

15. a) Describe an experiment to obtain I-V characteristics of an Zener diode. Explain with a circuit diagram use of a Zener diode as a voltage regulator.

(OR)

b) Prove the following Boolean identity

$$(A+B)(\overline{A}+\overline{B})(A+C) = AC.$$

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Describe the theory of working of plane transmission grating.

17. Describe Stern-Gerlach experiment and indicate the importance of the results obtained.

18. Describe the liquid drop model of the nucleus.
How can the semi-empirical mass formula be derived from it.

19. Derive Einstein's mass-energy relation.

20. State and prove De Morgans'laws.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Second Semester : Paper – II

OPTICS AND SOUND
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The ratio between phase difference and path difference is _____.
   a) $2\pi/\lambda$ b) $\lambda/2\pi$ c) π/λ d) $3\pi/\lambda$
2. The diffraction based on the wave theory was explained by _____.
   a) Fresnel b) Fraunhofer c) Thomas Young d) Bragg
3. In doubly refracting crystals, the varying parameter of the extraordinary wave are _____.
   a) velocity b) refractive index c) Both a & b d) None
4. In an oscillating system, the magnitude of the maximum displacement from equilibrium is called _____ of the motion.
   a) amplitude b) period c) phase d) frequency
5. In travelling sound waves, the displacement variations are _____ out of phase with pressure and density variations.
   a) 45^o b) 90^o c) 120^o d) 135^o
6. Square of the amplitude of a wave is proportional to its _____ .
7. A photograph of an interference pattern in 3 dimensional image is called _____.
8. If plain polarized light with its vibrations making an angle of 45^o with optic axis, passed through a quarter wave plate, the emergent light is _____.
9. The reduced mass of the two body oscillatory system is always _____ than their either mass.
10. The sound levels are measured in units of _____.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) Write a note on total internal reflection.

(OR)

b) Two coherent sources of monochromatic light of wave length 6000 A^o produce an interference pattern on a screen kept at a distance of one meter from them. The distance between two consecutive bright fringes on the screen is 0.5 *mm.* Find the distance between the two coherent sources.

12. a) Distinguish between Fresnel and Fraunhofer diffraction.

(OR)

b) How many orders will be visible if the wave length of the incident radiation is 5000 A^o and the number of lines on the grating is 2620 in 1 inch.

13. a) What do you mean by polarization?
How do you describe a linearly polarized wave.

(OR)

b) A quartz quarter wave plate is to be used with sodium light of wave length $\lambda = 589$ *nm.* What is the minimum thickness of such a plate? Given the refractive indices of the ordinary and extraordinary wave are $n_0 = 1.544,\ n_e = 1.553.$

14. a) Describe the working of simple pendulum.

(OR)

b) A particle executing SHM has angular frequency 6.28 s^{-1} and amplitude 10 *cm.* Find

a) the time period

b) the maximum speed

c) maximum acceleration

d) the speed when the displacement is 6cm from the mean position

e) speed at $t = 1/6$ sec, assuming that the motion starts from rest at $t = 0$.

15. a) Describe the theory of interference in sound waves.

(OR)

b) Spherical sound waves are emitted uniformly in all directions from a point source, the radiated power P being 25W. What are the intensity and the sound level of the sound wave at a distance $r = 2.5$ meter from the source? $I_0 = 1\times10^{-12}\ W/m^2$.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Explain the working principle of Michelson's interferometer. Also how to measure the changes in the length by means of interference fringes.

17. Explain the production of X-rays and the use of X-ray diffraction in sodium chloride structure analysis.

18. Illustrate the phenomena of double refraction.

19. Derive the period of oscillation of a Torsional Oscillator.

20. What happens when sound waves get reflected and travels back in the opposite direction.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Fourth Semester : Paper – I

ELECTRONICS AND COMMUNICATION – I
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The ratio of rms value of ac component to dc component in the rectifier output is called
   a) form factor b) ripple factor
   c) efficiency d) amplification factor
2. FET is a _____ device.
   a) voltage controlled b) current controlled
   c) saturation d) optical
3. The zero signal values of I_c *and* V_{CE} are known as
   a) load point b) saturation point
   c) operating point d) cut off point
4. In positive feedback the feedback voltage is _____with input voltage.
   a) out of phase b) in phase c) greater d) equal
5. Microphone converts
   a) light energy into electrical energy
   b) electrical energy into sound energy
   c) heat energy into electrical energy
   d) sound energy into electrical energy
6. A zener diode is operated in the _____ bias.
7. The emitter current of a transistor is of the order of _____.
8. The voltage gain of a transistor amplifier in terms of resistance is _____.
9. Each RC network connected in phase shift oscillator produces a phase shift of _____.
10. The expansion of SSB in communication is _____.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) With circuit diagram explain the action of a π filter.

(OR)

b) A $50V$ zener diode is used to regulate the voltage across a load resistance of 10Ω. The input voltage varies between $120V$ *and* $80V$ and the value of the series resistance is $5k\Omega$. Find the maximum and minimum value of zener current.

12. a) Explain how a transistor connected in CE mode is acting as an amplifier.

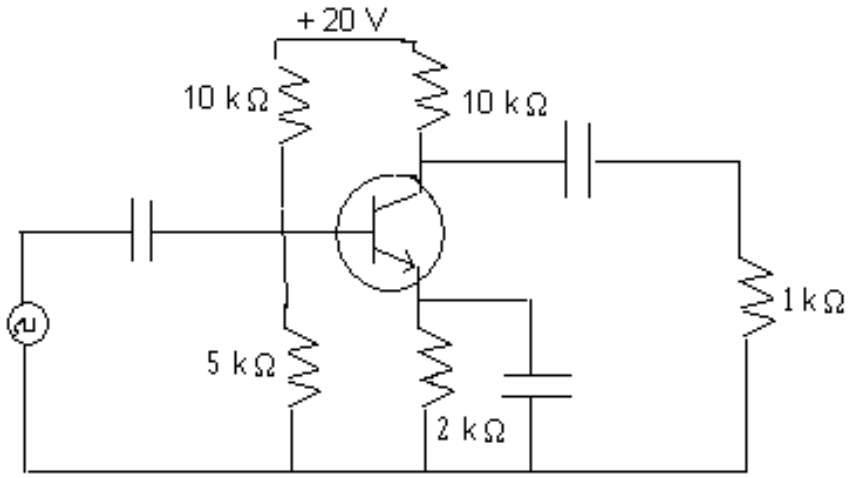
(OR)

b) A JFET has a drain current of $5mA$. *If* $I_{DSS} = 10mA$ *and* $V_{GS(OFF)} = -6V$, find the value of V_{GS} *and* V_P.

13. a) Give the various methods of transistor biasing and explain in detail the base resistor method.

(OR)

b) Draw the DC load line of the following transistor circuit.



14. a) With neat circuit diagram explain the action of a Hartley Oscillator.

(OR)

b) Construct an op amp circuit to produce the output of average of three input voltages.

15. a) Explain the theory of amplitude modulation.

(OR)

b) A sinusoidal carrier voltage of frequency $1\ MHz$ and amplitude $100V$ is amplitude modulated by sinusoidal voltage of frequency $5\ KHz$ producing 60% modulation. Calculate the frequency and amplitude of side bands.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Construct a full wave bridge rectifier and explain its working and find its efficiency.

17. Explain the construction and working of a JFET and specify the important terms in a FET circuit.

18. With neat circuit diagram, explain the function of RC coupled amplifier.

19. With neat diagram describe the construction and working of a Wien bridge oscillator and obtain its frequency of oscillation.

20. With block diagram describe the function of superhetrodyne receiver.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Second Semester : Paper – I

THERMODYNAMICS AND STATISTICAL MECHANICS

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The *SI* unit of thermal conductivity is
   a) $JSm^{-1o}C$ b) $JS^{-1}m^{-1o}C^{-1}$ c) $JS^{-1}m^{-1o}C$ d) $JS^{-1}m^{o}C^{-1}$
2. The value of critical volume *Vc* according to Vander-waals' gas equation is *Vc* =
   a) *b* b) 3*b* c) 2*b* d) 4*b*
3. An adiabatic process occurs at constant
   a) temperature b) pressure
   c) heat d) none of the above
4. The value of probability of an event cannot be
   a) zero b) one c) half d) negative
5. Photons obey _____ statistics.
   a) Maxwell – Boltzmann b) Bose – Einstein
   c) Fermi – Dirac d) none of the above
6. Wien's displacement law is expressed as _____.
7. The phenomenon of disappearance of electrical resistance of material below certain temperature is called _____.
8. First law of thermodynamics is based on the principle of conservation of _____ of a system.
9. A combination of position space and _____ is known as phase space.
10. Bosons have spin value of _____.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) Discuss the distribution of energy in a black body spectrum.

(OR)

b) The opposite faces of a metal plate of $0.2\ cm$ thickness are at a difference of temperature of $100^{o}C$ and the area of the plate is $200\ sq.cm.$ Find the quantity of heat that will flow through the plate in one minute $if\ \ K = 0.2\ CGS\ units.$

12. a) Describe Joule-Thomson porous plug experiment. What are the important inferences from this experiment?

(OR)

b) Calculate the critical temperature for CO_2, given that $a = 0.00874\ atoms.\ cm^6\ \ and\ \ b = 0.0023\ cm^3.$

13. a) State and prove Carnot"s theorem.

(OR)

b) The temperature of $5\ kg$ of air is raised by $1^{o}C$ at constant volume. Calculate the increase in its internal energy. Given $C_p = 993\ J\ kg^{-1}K^{-1},\ \gamma = 5/3.$

14. a) Deduce Boltzmann's entropy probability relation.

(OR)

b) The first excited state of hydrogen atom is $10.2eV$ above its ground state. What temperature is needed to excite hydrogen atoms to the first excited level?

15. a) What is Bose- Einstein statistics? Write the basic postulates used.

(OR)

b) Calculate the value of Fermi energy at absolute zero temperature.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Discuss in detail Forbes' method for finding the coefficient of thermal conductivity of a metal bar.

17. Deduce Vander-waals equation of state.

18. Obtain an expression for the efficiency of Carnot's engine.

19. Derive Maxwell-Boltzmann distribution law.

20. Derive an expression for the probable distribution of particles governed by Fermi-Dirac statistics.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Elective Subject : Sixth Semester : Paper – I

CLASSICAL MECHANICS, QUANTUM MECHANICS & THEORY OF RELATIVITY

Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Conservation of linear momentum follows from
   a) Kepler's law b) Newton's first law of motion
   c) Newton's second law of motion d) Newton's third law of motion
2. Hamiltonian may be expressed as $H =$
   a) $H(q, p, t)$ b) $H(q, t)$ c) $H(q, p)$ d) $H(p, t)$
3. The minimum energy required for an electron to escape from a particular metal surface is called as
   a) kinetic energy b) chemical energy
   c) pressure energy d) work function
4. The lowest energy of the harmonic oscillator is
   a) $\frac{1}{2} h\nu$ b) zero c) $2h\nu$ d) $h\nu$
5. One of the postulates of special theory of relativity is
   a) speed of light is relative b) speed of light is constant in free space
   c) time is relative d) mass is relative
6. The Lagrangian function of a system is given by _____.
7. Hamilton's canonical equation of motion constitutes a set of _____ order equations of motion.
8. The allowed energy levels of a particle in a box of length L are $E_n =$ _____.
9. The operator corresponding to energy is _____.
10. The clock on the moving rocket will appear to go _____ than the clock on the surface.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) State and prove D'Alembert's principle.

(OR)

b) Obtain the Lagrange's equation of motion for Atwood's machine.

12. a) Deduce canonical equations from a variation principle.

(OR)

b) Apply Hamilton's equations to a compound pendulum and show that the motion is SHM.

13. a) Derive an expression for group velocity.

(OR)

b) A hydrogen atom is $5.3\times10^{-11}m$ in radius. Use the uncertainty principle to estimate the minimum energy an electron can have in this atom.

14. a) Derive time-dependent form of Schrodinger equation.

(OR)

b) Electrons with energies of $1.0eV$ *and* $2.0eV$ are incident on a barrier $10.0eV$ *high and* $0.50nm$ wide.

i) Find their respective transmission probabilities.

ii) How are these affected if the barrier is doubled in width?

15. a) Obtain Einstein's mass energy relation.

(OR)

b) Show that *if* (x_1, y_1, z_1, t_1) *and* (x_2, y_2, z_2, t_2) are the coordinates of one event in S_1 *and* the corresponding event in S_2 respectively, then the expression $dS_1^2 = dx_1^2 + dy_1^2 + dz_1^2 - c^2dt_1^2$ is invariant under a Lorentz transformation of coordinates.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Deduce Lagrange's equation of motion from Hamilton's principle.

17. Explain the physical significance of Hamiltonian and obtain the Hamilton's canonical equations of motion.

18. Give the theory of Compton Effect and explain the experimental verification of it.

19. Obtain energy eigen values of a linear harmonic oscillator and explain zero point energy.

20. Deduce the formula for relativistic variation of mass with velocity. Briefly explain its significance.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Sixth Semester : Paper – I

NUCLEAR PHYSICS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Nucleus was discovered by
   a) Bohr b) Chatwick c) Rutherford d) Thompson
2. The value of e/m of beta particle
   a) decreases with increase of velocity b) is always constant
   c) decreases with decrease of velocity d) independent of velocity
3. Find the element in the following reaction ${}_4Be^9 + {}_2He^4 = \_\_\_\_ + {}_0n^1$.
   a) ${}_5C^{12}$ b) ${}_6N^{13}$ c) ${}_6C^{12}$ d) ${}_6N^{12}$
4. In stars, the release of energy is due to
   a) fission b) fusion c) collision d) transmutation
5. Neutrino has
   a) zero charge and integral spin b) positive charge and half spin
   c) zero charge and zero spin d) zero charge and half spin
6. Nuclear forces are_____ range forces.
7. The wavelength of gamma ray ranges from _____.
8. The element C^{14} is called _____.
9. Graphite rods used in nuclear reactor act as _____.
10. A baryon is made up of _____ number of quarks.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) With figure describe the action of a Geiger Muller counter.

(OR)

b) Alpha particles of energy $4\ MeV$ pass through an ionization chamber at the rate of 10 per second. Assuming all the energy is used in producing ion pair, Calculate the current produced if the energy required for the production of one ion pair is $30\ eV$.

12. a) Explain Geiger and Nuttal experiment for the measurement of range of alpha particle.

(OR)

b) $1\ gram$ of radium is reduced by $2.1\ mg$ in 5 years by a alpha decay. Calculate the half life period of radium.

13. a) Give the various applications of radio isotopes.

(OR)

b) For the following reaction $Ne^{23}(n,\alpha)\ F^{20}$ *if* Q value is $-4.5\ MeV$, find the threshold energy of the neutrons.

(Given $m_n = 1.00866u$ *and* $m_{Na} = 22.9898u$

14. a) Explain the chain reaction process and give any two applications.

(OR)

b) Explain the Carbon – Nitrogen cycle in sun and calculate the energy released in such process.

15. a) Briefly explain the big bang theory.

(OR)

b) Discuss about the particles and their anti-particles.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. With necessary theory, describe the construction and working of Betatron.

17. i) Explain neutrino theory of beta decay. **(5 + 5 = 10 Marks)**

ii) Explain how can you determine the wavelength of gamma rays by using Bragg formula.

18. Give an elaborate discussion about the various properties of neutron.

19. With neat diagram describe the construction and working of a nuclear reactor.

20. Outline the theory of Quark model.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – IV : Skill Based Subject : Fourth Semester : Paper – I

ENERGY SCIENCE – II
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Basically there are _____ designs of solar cooker.
   a) three b) five c) seven d) two
2. Which one of the following instrument to get high temperatures by concentrating solar radiations onto a specimen.
   a) Solar furnace b) Solar cooker
   c) Solar still d) none of the above
3. _____ is of course of a form of solar power or solar related power as it sometimes called
   a) Wind Power b) bio gas
   c) both a and b d) none of the above
4. Solar cells are used in space applications in order to
   a) reduce the cost of power generation
   b) reduce the total weight of the satellite
   c) increase the life period d) all of the above
5. The temperature attained is more than 1000^{o}C in a
   a) Solar air heater b) solar water heater
   c) solar pond d) solar furnace
6. In wind mills, energy conversion taking place from
   a) kinetic to electrical b) kinetic to mechanical
   c) mechanical to electrical d) none of the above
7. The box type solar cooker is an example of a solar device for
   a) low temperature applications b) medium temperature applications
   c) high temperature applications d) all the tempertures
8. Coal , oil, gas, uranium and hydro are commonly known as _____.
9. ISRO stands for _____.
10. The term BARC stands for _____.

SECTION – B

Answer ALL Questions : **(4 × 10 = 40)**

11. a) Discuss briefly about the various energy sources available in the earth.

(OR)

b) What is a fuel cell? Explain briefly about the function of Hydrox fuel cell.

12. a) What are the advantages and disadvantages of fuel cell?

(OR)

b) Give the advantages and disadvantages of Bio-logical conservation of solar energy.

13. a) Explain about the applications of solar energy in space.

(OR)

b) Explain about the applications of Solar Photovoltaic system.

14. a) Explain Ion exchange membrane fuel cell with neat diagram.

(OR)

b) "Enjoy Solar Energy today and help tomorrow" – Justify the statement.

SECTION – C

Answer any TWO Questions : **(2 × 12½ = 25)**

15. Discuss briefly about solar cooking and working of a solar cooker.
16. Explain Solar furnaces in detail.
17. Give a brief account on wind energy.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – IV : Skill Based Subject : Sixth Semester : Paper – III

MEDICAL INSTRUMENTATION
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. Any device converting one form of energy into another form is called
   a) amplifier b) oscillator c) rectifier d) transducer
2. Bio-Medical instrument must have
   a) high precision b) good calibration
   c) accurate output d) all the above
3. _____ is called "Cardiac Pacemaker".
   a) Sinoatrial node b) Atrio-ventricular node
   c) Purkinjie fibers d) None of the above
4. _____ is used to measure the volume of exhaled air.
   a) Barometer b) Lactometer c) Spirometer d) Spectrometer
5. Advantage of Ventilator treatment are
   a) adequate ventilation b) elimination of respiratory work
   c) increased intrathoracic pressure d) all the above
6. Servo Controlled Ventilators work in _____ mode.
7. An anesthetic is a mixture of Nitrous oxide, Fluorocarbon and _____.
8. 80% of our body atoms are made of _____.
9. The use of super conducting magnets in MRI is to obtain high strength _____ field.
10. Gamma ray camera uses radioisotope _____.

SECTION – B

Answer ALL Questions : **(4 × 10 = 40)**

11. a) Draw the block diagram of Bio-Medical instrument system.

(OR)

b) Explain about Augmented unipolar Limb leads system used in ECG.

12. a) Describe brain waves on the basis of frequency.

(OR)

b) Discuss about the placement of EEG electrodes with neat diagram.

13. a) List out the techniques used in surgical diathermy.

(OR)

b) Describe population inversion phenomena in LASER.

14. a) Explain the working of Gamma ray camera.

(OR)

b) Discuss about Positron Emission Tomography.

SECTION – C

Answer any TWO Questions : **(2 × 12½ = 25)**

15. Draw Einthoven triangle and explain Bipolar Limb leads.
16. Explain the working of Anesthesia machine.
17. Draw the block diagram of MRI system.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – III : Core Subject : Fourth Semester : Paper – II

PROGRAMMING IN C
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. 'C' is a
   a) Object oriented language b) High level language
   c) Assembly language d) Machine level language
2. The statement which is used to terminate the control from the loop is
   a) break b) continue c) goto d) exit
3. _____ operator is used for conditional operator.
   a) . b) & c) ? d) <
4. Integer occupies
   a) Two bytes b) Four bytes c) One byte d) Eight bytes
5. _____ operator is used for structure.
   a) -> b) . c) & d) *
6. The function calls itself is called _____.
7. _____ is an increment Operator.
8. _____ is an entry control looping statement.
9. _____ key word is used to return a value to main program.
10. _____ operator is used to find the address of the variable.

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) Define Constant and Variable.

(OR)

b) Write the structure of C Program.

12. a) Explain any three operators in C.

(OR)

b) Explain any four mathematical functions in C.

13. a) Write the syntax of switch statement with an example.

(OR)

b) Explain about for looping statements in C.

14. a) Define :- Array. Explain its types.

(OR)

b) Explain about user defined functions.

15. a) Explain about Pointers.

(OR)

b) Write the syntax of structure with an example.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Write a C program to generate Fibonacci series.
17. Write a C program to find the sum of digits of a given number.
18. Write a C program to arrange the numbers in ascending order.
19. Write a C program for addition of two matrix.
20. Write a C program to find the factorial using function.

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B.A. / B.Sc. Degree (Semester) Examinations, April 2017
Part – IV : Non-Major Elective Subject : Second Semester : Paper–I

CIVIL DEFENCE AND ADVENTURE TRAINING
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The angle between the heels in Vishram position is
   a) 30^{o} b) 40^{o} c) 45^{o} d) 60^{o}
2. In tez chal the distance between cadets is
   a) 45'' b) 30'' c) 60'' d) 75''
3. In ADHA dahine mur the squad turn
   a) 45^{o} b) 180^{o} c) 90^{o} d) 30^{o}
4. Sequence of firing is
   a) HAT b) ATH c) HTA d) AHT
5. Cadets stand one behind another is called
   a) file b) Rank c) blank file d) None of these
6. In MR, Green color represents
   a) Reserved forest b) Cultivated area
   c) living area d) dry river
7. The word of command for THAM finishes on _____ foot in marching.
   a) left b) right
   c) left or right d) none of these
8. The angle between five fingers stretched in hands method is
   a) 19^{o} b) 12^{o} c) 8^{o} d)5^{o}
9. Expand the term WT:
10. Expand the term MR:

SECTION – B

Answer ALL Questions : **(4 × 10 = 40)**

11. a) Define the following terms: a) Rank and b) File c) blank file

(OR)

b) What are the types of adventure training?

12. a) Write the five aims of Drill.

(OR)

b) What are the basic requirements of good firer?

13. a) Draw the structure of the arrow head formation and spear head formation of section formation.

(OR)

b) Differentiate between 'line tor' and 'vissarjan'.

14. a) Explain the functions of Civil defence.

(OR)

b) Write the ten parts of the liquid prismatic compass.

SECTION – C

Answer any TWO Questions : **(2 × 12½ = 25)**

15. Explain the different types of judging distance in field graft.
16. Explain the different types of fire control order.
17. What is a Map? Explain the map readings.
18. Explain the parts of the 0.22 rifle.

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B.Sc. Physics Degree (Semester) Examinations, April 2017
Part – IV : Skill Based Subject : Sixth Semester : Paper – I

OPTO ELECTRONICS – II
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. The colour of a LED can be changed by
   a) using different band gap semiconductor
   b) by changing the doping level of the semiconductor
   c) by increasing applied voltage d) none of the above
2. Which of the following is not applicable for Laser
   a) no tunning arrangement b) higher emission efficiency
   c) narrow spectral width d) provision for confinement
3. Which of the following is the transmission frequency in optical fibre?
   a) 10^9 Hz b) 10^{11} Hz c) 10^{14} Hz d) none
4. Optical fibre was invented in
   a) 1950 b) 1960 c) 1970 d) 1975
5. Light propagates along optical fibre by
   a) total internal reflection b) total internal refraction
   c) both (a) and (b) d) none of the above
6. In fabrication of optical fibre is higher than that of cladding because of
   a) It is cheap and easily available b) maximum distance operation
   c) it is obtained in purest form d) none of the above
7. Transmission of signal through optical fibre is of the form of
   a) Sound b) electricity c) light d) speed

8. Attenuation in optical fibre can be measured in

a) dB/km b) dB/m c) KdB/m d) dBm/m

9. Function of receiver in optical fibre is to

a) Reshape the degraded signal only

b) only amplify of degraded signal

c) Both amplify and reshape the degraded signal

d) none of the above

10. Refractive index of the core of an optical fibre is higher than that of cladding because of

a) better confinement of light b) maximum distance operation

c) easy to handle d) higher life time of the material

SECTION – B

Answer ALL Questions : **(4 × 10 = 40)**

11. a) Write down the characteristics of different fibre fabrication process.

(OR)

b) Explain external CVD technique with neat diagram.

12. a) Give a brief account on long-haul communication.

(OR)

b) i) While a student was calculating the absorption losses, he found that 4% of the power input to a $10m$ fibre was absorbed by OH ions.

ii) A fibre has $150m$ length and is fed with an optical power of $10\mu W$. The output power is found to be $8\mu W$. Calculate the loss in dB/km.

13. a) What is coupler? Explain biconically tapered directional coupler with neat diagram.

(OR)

b) Explain simplex and duplex communication system.

14. a) List out the types of losses occurred in optical fibre and draw the flowchart for optical fibre transmitter design.

(OR)

b) Illustrate the important applications of integrated optic fibre technology.

SECTION – C

Answer any TWO Questions : **(2 × 12½ = 25)**

15. Explain about the three different process of internal chemical vapour deposition method in optical fibre communication.

16. Discuss about the design of a fibre optic receiver.

17. Discuss briefly about the various losses occurred in optical fibre.

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B.A. / B.Sc. Degree (Semester) Examinations, April 2017
Part – IV : Non-Major Elective Subject : Second Semester : Paper–I

ELECTRICAL HOME APPLIANCES
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 1 = 10)**

1. _____ is a device that supplies electrical energy to one or more electric loads
2. Bodies which do not allow the charge or electricity to pass through them are called insulators. **(True / False)**
3. The term DC stands for _____.
4. A stabilized power supply sometimes known as a _____ supply.
   a) regulated power b) frequency power
   c) inductance power d) none of these
5. The frequency of A.C. mains is _____ Hz.
   a) 100 b) 50 c) 70 d) 60
6. A choke coil is an inductance coil which is used to control the current in an ac circuits. **(True / False)**
7. The term LED stands for
   a) Light Emitting Diode b) Light Exit Diode
   c) Light Energy Diode d) none of these
8. The melting point of a tungsten filament is
   a) 3400°C b) 4400°C c) 2900°C d) 2400°C
9. The normal human body temperature is 34.9°C. **(True / False)**
10. In electric water heaters _____ energy is converted _____ energy.
    a) light, sound b) light, heat
    c) electrical, heat d) electrical, light

SECTION – B

Answer ALL Questions : **(4 × 10 = 40)**

11. a) Discuss about single phase, two phase and three phase connections.

(OR)

b) Explain the concept of stabilized power supply.

12. a) List out the difference between A.C and D.C.

(OR)

b) Explain the construction and working of a Incandescent lamp.

13. a) Describe Fluorescent lamp with a neat sketch.

(OR)

b) Explain the phenomenon of seven segment display.

14. a) Discuss about the electric heaters.

(OR)

b) Write a detailed note on Gaiser and Immersion rod heakers.

SECTION – C

Answer any TWO Questions : **(2 × 12½ = 25)**

15. What is earthing? Briefly explain the two types of earthing with neat diagrams.
16. Describe the construction details and advantages of a transformer.
17. With neat diagram, explain the parts and working principle of an electric iron box.