Federal Board HSSC-II Examination
Physics Model Question Paper

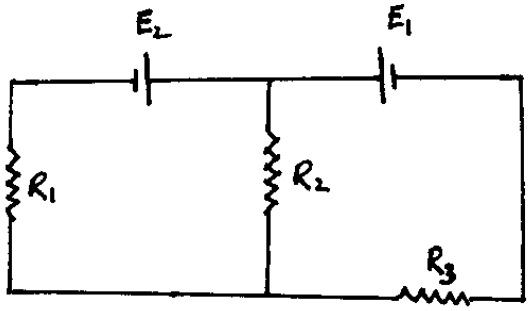
Time allowed: 2.35 hours Total Marks: 68

Note: Sections 'B' and 'C' comprise pages 1-5 and questions therein are to be answered on the separately provided answer book. Answer all the questions from section 'B' and section 'C'. Use supplementary answer sheet i.e., sheet B if required. Write your answers neatly and legibly.

SECTION – B
(42 marks)

NOTE: Attempt **ALL** the questions. The answer to each question should not exceed 3 to 4 lines.

Q.2 Apply KVL, what are the equations for voltage changes in the two loops as shown in the figure below? (2)



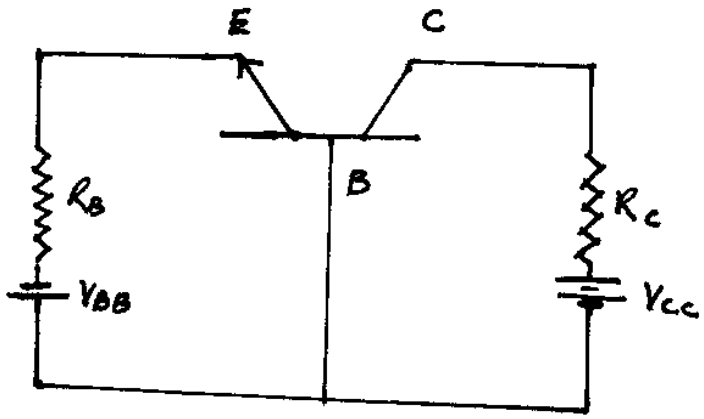
Q.3 Why is soft iron preferred as the core material for making transformers? (2)

Q.4 How does the frequency response of a capacitor differ from that of an inductor when subjected to a source of AC voltage? (2)

Q.5 Draw the impedance diagram for an RLC series circuit at resonance and show why its power factor is equal to one. (2)

Q.6 Write Boolean expression for XNOR gate. What will be its output when both inputs are made zero? (2)

Q.7 Why is Vcc made high in comparison to V_{BB} as shown in the figure. (2)



Q.8 Are de-Broglie waves associated with all moving objects? Why is it not significant for macroscopic objects? (2)

Q.9 Why should the target material in the production of x-ray unit have high melting point? (2)

Q.10 Why is the mass of a nucleus always less than the total mass of all the protons and neutrons making up the nucleus? (2)

Q.11 Why do charged particles follow circular paths when projected at a right angle to the magnetic field? (2)

Q.12 What is the origin of γ-rays compared to the origin of x-rays? (2)

Q.13 What is the absolute potential at a distance of 20cm from a point charge of -4μC? (2)

Q.14 A conductor with a cross-sectional area 10^{-4} m^2 carries an electric current of 1.2 A. If the number of free electrons be 5 x 10^{28} m^{-3}, calculate the electron drift velocity. (3)

(OR)

An electron and a proton possessing equal momenta are injected into a region at right angles to a uniform magnetic filed. What is the ratio of their radii of curvature while moving inside the magnetic field? (3)

Q.15 A circuit has a resistance of 100Ω. What should be the value of another resistor to be connected to it so as to reduce the total circuit resistance to 60 Ω. Also show by circuit diagram. (3)

(OR)

A proton is moving under the influence of a perpendicular magnetic field (B) and possesses energy E. What will be the energy of the proton if the magnetic filed is increased to 4B while it is compelled to move in a circular path of same radius? (3)

Q.16 Three equal resistors connected in series across a source of e.m.f together dissipate a power of 10w. What should be the power dissipation if the same resistors are connected in parallel across the same source of e.m.f? (3)

(OR)

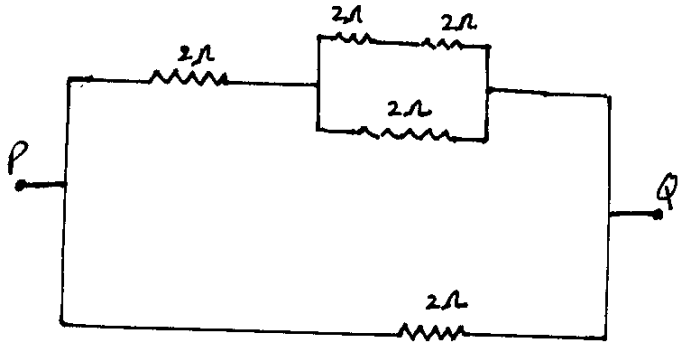
The eye can detect as little as 1×10^{-18}J of electromagnetic energy. How many photons of orange light whose wavelength is 600 nm does this energy represent? (3)

Q.17 A load of 20 Ω with a power rate of 5.0 watt is to be connected to a 24v battery. What is the minimum resistance of the series resistor that will prevent the power rate from increasing? (3)

(OR)

Derive an expression for the inductance of a solenoid of length '*l*', cross-sectional area 'A' and having number of turns 'N'. (3)

Q.18 Circuit diagram shows a network of resistors each of resistance 2Ω. (3)



What is the effective resistance between the points P & Q?

(OR)

Two wires 'X' and 'Y' each of the same length and the same material are connected in parallel to a battery. The diameter of 'X' is half that of 'Y'. What fraction of the total current passes through 'X'? (3)

Q.19 How much charge is stored in a 3.0μF capacitor and a 6.0μF capacitor when joined in series with an 18V battery? (3)

(OR)

Calculate the wavelength of electrons that have been accelerated from rest through a P.D of 100V. What kind of electromagnetic radiation has wavelength similar to this value? (3)

SECTION – C

(Marks: 26)

Note: Attempt **ALL** the questions.

Q.20 What is the need of using a transformer in an electrical network? Explain its working principle. How can this transformer be made to step up and to step down? Discuss power losses in a transformer, how can they be minimized? (8)

Q.21 a. State and explain Gauss's law, also derive $\vec{E} = \frac{\sigma}{2\varepsilon_0}\hat{r}$, for an electric field due to an infinite sheet of charge. Where 'σ' is the surface charge density, ε_o is permittivity of free space and is a unit vector. (1+2+2)

b. Two point charges q = -1.0 10^{-6}C and q_2 = +4.0 10^{-6}C, are separated by a distance of 3.0m. Find and justify zero field location. (3)

Q.22 a. What is a galvanometer? Explain its construction and basic principle of working. (5)

b. What is meant by sensitivity of a galvanometer? How can a galvanometer be made more sensitive? (3)

c. Show by diagrams how a galvanometer can be transformed into an ammeter and a voltmeter? (2)

(OR)

a. Explain the experiment photoelectric effect, discuss its important results. (3+3)

b. A sodium surface is illuminated with light of wavelength 300nm. The work function of sodium metal is 2.46ev. Calculate:

(i) The max KE of the ejected electron. (2)

(ii) The cut-off wavelength for sodium. (2)