PHYSICS

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PHYSICS (GUJRATI ENGLISH)

SAMPLE QUESTION PAPER

Part A

1. A charged ball from a silk thread, which makes an angle θ with a large charged

conducting sheet. The surface charge density σ of the sheet is proportional to.....

A. $\tan\theta$

B. $\sin\theta$

C. $\cos\theta$

D. $\cot\theta$

Answer: A

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2. Two charges are at a distance d apart. If a copper plate of thickness $\frac{d}{2}$ is placed between them, if effective force will be,

A. 2F

B. $F/2$

C. 4F

D. $\sqrt{2}F$

Answer:

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3. A point charge q is placed at the centre of a cube of side length L . The electric flux emerging from the cube is.....

A. $\frac{q}{e_0}$

B. zero

C. $\frac{(6ql)^2}{e_0}$

D. $\frac{q}{6L^2e_0}$

Answer: A

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4. What charge would be required to electrify a sphere of radius 25 cm, so as to get a surface charge density of $\frac{3}{\pi}\frac{C}{m^2}$?

A. 0.25

B. 0.75 C

C. 0.57C

D. 0.5C

Answer: B

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5. Two field lines can never crosses each other because ,

A. field lines are closed curves

B. field lines repels each other

C. field line crowded only near the charge

D. field has a unique direction at each point

Answer: D

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6. IF have energy of a $100\mu F$ capacitor charge to 6kV could all be used to lift a 50 kg mass, then the greatest vertical height through which mass could be raised in..... m

A. 3.6

B. 0.6

C. 1.2

D. 12

Answer: A

7. The electrical potential at a certain distance from a point charge is 600V the electric field is $200N/C$. The distance of the point charge is....m.

A. 2

B. 3

C. 1

D. 0

Answer: B

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8. The dimensional formula of dielectric strength is.....

A. $M^1L^1T^2Q^{-1}$

B. $M^1L^2T^{-2}Q^{-1}$

C. $M^{-1}L^{-1}T^2Q^1$

D. $M^{-1}L^{-1}T^2Q^2$

Answer: A

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9. IF X joule of work must be done to move electric charge to 4C from a place, where potential is -10V to another place. Where potential is 5V, then the value of X....J.

A. 30

B. 60

C. 50

D. 100

Answer: B

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10. A wire of resistance `20 Omega is bent in the form of a circle. Then the effective resistance between the ends of the diameter is.....

A. 5Ω

B. 10Ω

C. 15Ω

D. 20Ω

Answer: A

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11. A carbon resistor has coloured bands orange, green, golden and silver then its resistance will be

A. $2.5 \pm 10\,\%\,\Omega$

B. $3.5 \pm 5\,\%\,\Omega$

C. $3.5 \pm 10\,\%\,\Omega$

D. $350 \pm 10\,\%\,\Omega$

Answer: C

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12. The resistance of wire is 10Ω IF the length of wire is increase by n% the new resistance is 10.2Ω then n.....

A. 1

B. 2

C. 3

D. 4

Answer: A

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13. Which of the following is correct explanatio for mobility μ?

A. $\mu = \frac{m\tau}{e}$

B. $\mu = \frac{em}{\tau}$

C. $\mu = \frac{e\tau}{m}$

D. $\mu = \frac{e}{m}$

Answer: C

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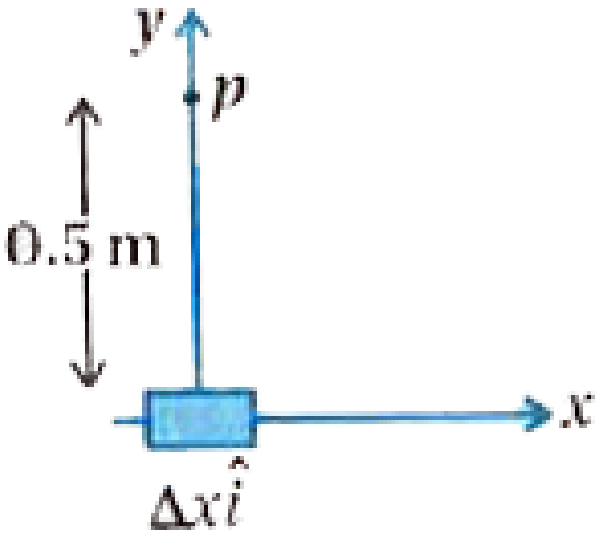
14. An element $\Delta l = \Delta x \hat{i}$ is placed at origin and carries a current I=10A. IF $\Delta x = 1cm$

magnetic field at point P is..... T.



A. $-4 \times 10^{-8}\hat{j}$

B. $4 \times 10^{-8}\hat{j}$

C. $4 \times 10^{-8}\hat{i}$

D. $4 \times 10^{-8}\hat{k}$

Answer: D

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15. A circular current loop of magnetic moment M is in an arbitary orientation is an external magnetic field $\overrightarrow{B}$. The work done to rotate the loop by 30° about an axis perpendicular to its plane is....

A. MB

B. $\frac{\sqrt{3}}{2}MB$

C. $\frac{MB}{2}$

D. zero

Answer:

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16. In a cyclotron, a charge particle,

A. undergoes acceleration all the time

B. speeds up the dees because of the magnetic field

C. speeds up in a dee.

D. slows down within a dee and speeds up between does

Answer: A

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17. A permanent magnet in the shape of a thin cylinder of length 10cm has $M = 10^6 A/m$. Calculate the magnetisation current Im.....

A. $10^2 A$

B. $10^4 A$

C. $10^5 A$

D. $10^6 A$

Answer: C

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18. A magnet of m magnetic moment is rotate up to 360° in magnetic field H then the work done is.....

A. 0

B. mH

C. 2mH

D. 2πmH

Answer: A

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19. The dimensional formula of $\frac{B^2}{2\mu_0}$ is.....

A. $M^{-1}L^1T^2$

B. $M^1L^{-1}T^{-2}$

C. $M^{-1}L^{-1}T^{-2}$

D. $M^1L^1T^2$

Answer: B

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20. A square of side LM lies in the xy plane in a region, when the magnetic field is given by $\vec{B} = B_0\left(2\hat{i} + 3\hat{j} + 4\hat{k}\right)$ T where $B_0$is

constant. The magnitude of flux passing through the square is .....Wb.

A. $2B_0L^2$

B. $3B_0L^2$

C. $4B_0L^2$

D. $\sqrt{29}B_0L^2$

Answer: C

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21. The self inductance $\angle$ of a solenoid of length and are of cross section A with a fixed number of turns N increases as,

A. l and A increase

B. l decreases and A increases

C. l increases and A decreases

D. both l and A decreases

Answer: B

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22. A 1m long metal wire moving perpendicular with speed $5m/s$ is a magnetic field of 0.1T. Then the induced emf between two ends of wire is.....V

A. 1

B. 2

C. 0.5

D. 0.25

Answer: C

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23. The output of a step down transfomer is measured to be 24V when connected to a 12W light bulb. The value of the peak current is.....A

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. 2

D. $2\sqrt{2}$

Answer: A

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24. A capacitor of $250\mu F$ is connected parallel with a inductor of 0.16mH. IF the effective resistance is 20Ω then resonant frequency..... Hz.

A. 9×10^4

B. 16×10^7

C. 8×10^5

D. 9×10^3

Answer:

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25. A coil of reactance 8Ω and resistance 6Ω is connected in DC circuit then the effective resistance of the circuit .....Ω.

A. 14

B. 8

C. 6

D. $\frac{24}{7}$

Answer: C

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26. How much average power is stored in an inductor when it is connected with AC source?

A. $\frac{1}{2}Li^2$

B. Li^2

C. O

D. Li

Answer: C

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27. The ratio of contributions made by the electric field and magnetic field components to the intensity of the EM wave is.....

A. $C:1$

B. $C^2 : 1$

C. $1 : 1$

D. $\sqrt{C} : 1$

Answer: C

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28. The electric field intensity produced by the radiations coming from 100W bulb at a 3m distance is E. The electric field intensity

produced by the radiations coming from 50W bulb at the same distance is.....

A. $\frac{E}{2}$

B. 2E

C. $\frac{E}{\sqrt{2}}$

D. $\sqrt{2}E$

Answer: A

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29. The charging current of capacitor is 0.25A. Then the displacement current around its plates is.....A

A. 1.25

B. 1.5

C. 0.25

D. 0.5

Answer: C

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30. If lower half of a concave mirror is blackned then

A. image distance increases

B. image distance decreases

C. image intensity increases

D. image intensity decreases

Answer: D

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31. When a light wave travels from air to glass,

A. its wavelength decreases

B. its wavelength increases

C. there is no change in wavelength

D. its frequency decreases

Answer: A

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32. A fish which is at a depth of 12cm in water $\left(\mu = \frac{4}{3}\right)$ is viewed by an observer on the bank of a lake. Its apparent depth as observed by the observer is .....cm.

A. 3

B. 9

C. 12

D. 16

Answer: B

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33. In an equilateral prism if incident angle is 45 then minimum deviation is.....

A. 30°

B. 60°

C. 45°

D. 90°

Answer: A

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34. Astigmatism for a human eye can be removed by using.....

A. concave lens

B. convex lens

C. cylindrical lens

D. prism lens

Answer: C

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35. In young double slit experiment, if the width of 4^{th} bright fringe is $2 \times 10^{-2} cm$, then the width of 6^{th} bright fringe will be....cm.

A. 10^{-2}

B. 3×10^{-2}

C. 2×10^{-2}

D. 1.5×10^{-2}

Answer: C

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36. The bending of beam of light around corners of obstacles is called.

A. reflection

B. refraction

C. diffraction

D. interference

Answer: C

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37. An unpolarised beam of light of intensity l_0 falls on a poloroid. The intensity of the emergent beam is

A. $\frac{I_0}{2}$

B. I_0

C. $\frac{I_0}{4}$

D. zero

Answer: A

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38. Which of the given phenomenon is based on the fact that light waves are transverse electromagnetic waves?

A. Diffraction

B. Interference

C. Polarisation

D. Refraction

Answer: C

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39. The condition for obtaining secondary maxima in the diffraction pattern due to single slit is...

A. $a \sin \theta = n\lambda$

B. $a \sin \theta = (2n - 1)\frac{\lambda}{2}$

C. $a \sin \theta = (2n - 1)\lambda$

D. $a \sin \theta = \frac{n\lambda}{2}$

Answer: B

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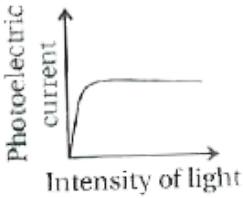
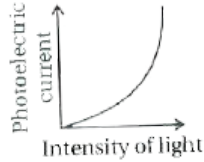
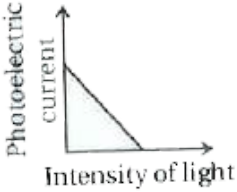
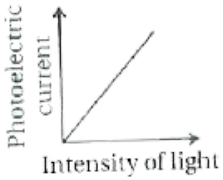
40. Variation of photoelectric current with intensity of light is shown by graph.....

A. 

B. 

C. 

D. 

Answer: D

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41. An X ray tube is operated at 50kV, the maximum wavelength produced is.....A.

A. 0.75

B. 0.25

C. 1

D. 2.5

Answer: B

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42. de- Broglie wavelength associated with an electron, accelerating through a potential

A. gamma rays

B. X-rays

C. ultraviolet

D. visible region

Answer: B

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43. IF E_p and E_k represent potential energy and kinetic energy respectively of an orbital electron, then according to Bohr's theory.

A. $E_k = -\frac{E_p}{2}$

B. $E_k = E_p$

C. $E_k = 2E_p$

D. $E_k = -2E_p$

Answer: A

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44. Highest energy level of an electron corresponds to $n = \infty$ and it has an energy of.....eV.

A. zero

B. ∞

C. 13.6

D. -13.6

Answer: A

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45. An hydrogen atom in its ground state absorbs 10.2 eV of energy. The orbital angular momentum is increased by.....js.

A. 1.05×10^{-34}

B. 3.16×10^{-34}

C. 2.11×10^{-34}

D. 4.22×10^{-34}

Answer: A

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46. Heavy stable nuclei have more neutrons then protons this is because of....

A. neutrons are heavier than proton

B. electrostatic force between protons are repulsive

C. neutron decay into protons through

$B - decay$

D. nucleur forces between neutrons are weaker than that between protons.

Answer:

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47. A radioactive substance decays to $\frac{1}{16}th$ of the initial mass in 40 days. The half life of the substance is..... Day.

A. 20

B. 10

C. 5

D. 2.5

Answer: B

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48. Fill in the blank. $\_ 15^{32}P \rightarrow \ldots . + \bar{e} + \bar{v}$

(anti neutrino)

A. $_{7}^{14}N$

B. $_{5}^{11}B$

C. $_{16}^{32}S$

D. $_{10}^{22}Ne$

Answer: C

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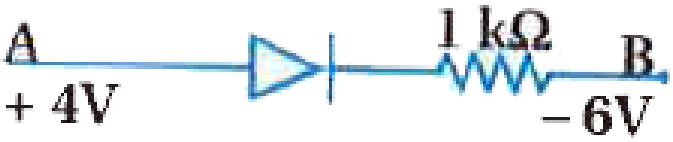
49. In ideal junction diode as shown in figure the current flowing through AB is.....A.



A. 10^{-2}

B. 10^{-1}

C. 10^{-3}

D. 0

Answer: A

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50. The boolean expression of NOR gate is.....

A. $y = \overline{A}$

B. $y = A + B$

C. $y = A.B$

D. $y = \overline{A + B}$

Answer: D

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Part B Section A

1. Define electric line of force and give its two important properties.

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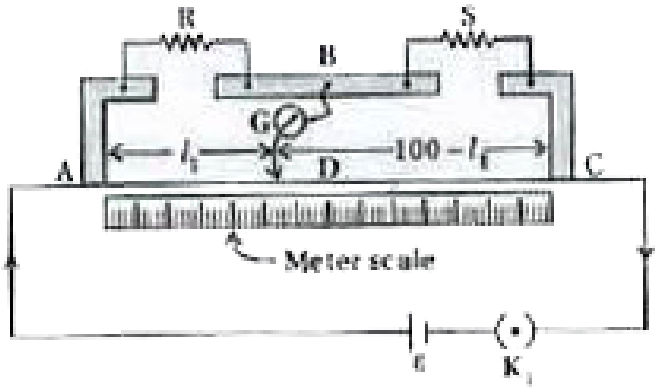
2. In a meterbridge, the null point is found at a distance of 33.7cm from A. If a resistance of 12W is connected in parallel with S, the null points occurs at 51.9cm Determine the values

of R and S.



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3. The wires which connect the battery of an automobile to its starting motor carry a current of 300a (for a short time). What is the force per unit length between the wires if they

are 70cm long and 1.5 cm apart? IS the force attractive or repulsive?

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4. A closely wound solenoid of 800 turns and area of cross section $2.5 \times 10^{-4} m^2$ carries a current of 3.0A. Explain the sense in which the solenoid acts like a bar magnet.

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5. The earth magnetic field at the equator is approximately 04.G. Estimate the earth's dipole moment.

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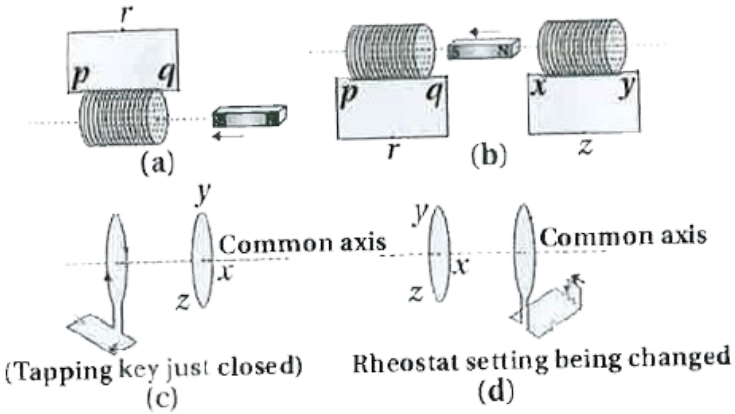
6. Predict the direction of induced current in the situations described by the following

figures (a) to (d).



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7. Give any four characteristic of electromagnetic waves.

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8. Explain the nuclear binding energy with example of $_8^{16}O$.

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9. Find the energy equivalent of one atomic mass unit, first in joules and then in MeV. Using this express the mass defect of $_8^{16}O$ in MeV/c^2.

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10. Explain the use of Zener diode as a voltage regulator.

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Part B Section B

1. A room has AC run for 5 hours a day at a voltage of 220V. The wiring of the room consists of Cu of 1mm radius and a length of 10m. Power consumption per day is 10 commerical units. What fraction of its goes in

the joule heating in wires? What would happen if the wiring is made of aluminium of the same dimensions.

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2. What is parallel connections of cells? Derive the equivalent equation of parallel connections of two cells.

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3. For a circular coil of radius R and N turns carrying current. Prove that the magnitude of the magnetic field at a point on its axis at a distance X from its centre is given by

$$B = \frac{\mu_0 I R^2 N}{2(x^2 + R^2)^{3/2}}$$

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4. Explain the reflection of a plane wave using Huygen's principle.

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5. Two towers on top of two hills are 40km apart. The line joining them passes 50m above a hill halt way between the towers. What is the longest wavelength the towers without appreciable diffraction effects?

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6. What is the de-Broglie wavelength associated with (a) an electron moving with a

speed of $5.4 \times 10^{6} ms^{-1}$ and (b) A ball of mass 150 g travelling at $30.0 ms^{-1}$?

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7. Photoelectric effect can not be explain by using wave theory of light why?

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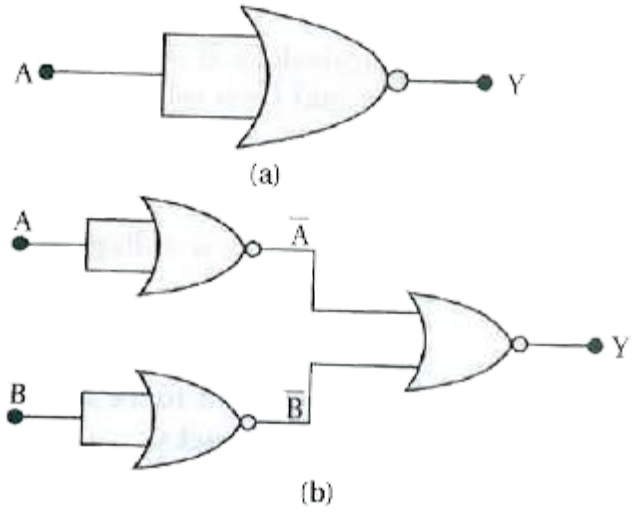
8. Write the truth table for the circuits given in figure consisting of NOR gates only. Identify

the logic operations (OR, AND, NOT) performed by the two circuits.



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Part B Section C

1. Two charges –q and +q are located at points (0, 0, –a) and (0, 0, a), respectively.

(a) What is the electrostatic potential at the points (0, 0, z) and (x, y, 0) ?

(b) Obtain the dependence of potential on the distance r of a point from the origin when $r/a >> 1$.

(c) How much work is done in moving a small test charge from the point (5,0,0) to (–7,0,0) along the x-axis? Does the answer change if the path of the test charge between the same points is not along the x-axis?

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2. Derive an expression for the impedance of an a.c circuit with an inductor L and a resistor R in series.

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3. A resistor of 200Ω and a capacitor of $15.0\mu F$ are connected in series to a 220V, 50Hz as source .

(a) Calculate the current in the circuit.

(b) Calculate the voltage (rms) across the resistor and the capacitor. Is the alebraic sum of these voltages more than the source voltage? If yes resolve the paradox.

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4. Use the mirror equation to deduce that:

(a) An object placed between f and 2f of a concave mirror produces a real image beyond 2f.

(b) A convex mirror always produce a virtual image independent of the location of the object.

(c) The virtual image produced by a convex mirror is always diminished in size and it located between the focus and the pole.

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5. A hydrogen atom initially in the ground level absorbs a photon, which excites it to be the

n=4 level. Determine the wavelength and frequency of the photon.

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