1st Semester Regular/Back Examination: 2022-23
Basic Civil Engineering
BRANCH(S): AEIE, AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIME,
CSEDS, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E,
ETC, IT, MECH, METTA, MINERAL, MME,
CE, CSE, EE
Time : 3 Hour
Max Marks : 100
Q.Code : L628
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

(2 x 10)

Q1   Answer the following questions :

a)   Write two methods adopted in direct measurement.
b)   Define bearing of line.
c)   List out the different modes of transportations.
d)   Write the relationship between fore bearing and back bearing of line.
e)   Name different building components.
f)   Differentiate between Rubble masonry and Ashlar masonry
g)   Define gravity dam.
h)   What should be the Quality of mixing water as BIS.
i)   State the importance of Civil Engineering.
j)   Write the standard size of bricks as per BIS.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of   (6 × 8)
Twelve)

a)   Summarize about the different broad disciplines of Civil Engineering.
b)   Describe in detail about different types of cement used in construction sector.
c)   Differentiate between direct and indirect ranging with neat sketches.
d)   Define Workability of concrete. Write the tests for determination of workability of concrete.
e)   Write various advantages of Using Total Stations in surveying work.
f)   Write note on different types of steels used in civil engineering works.
g)   State and explain about different types of weirs used as hydraulic structures.
h)   Briefly explain about classification of stones.
i)   Briefly explain details about the qualities of good bricks.

j) Differentiate between shallow and deep foundations with neat sketches.

k) Provide a detailed classification canals used for irrigation purpose.

l) Describe about various aspects to be considered while designing transportation engineering.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Describe in detail about different types of tests are conducted for cement for its quality assessment.   (16)

Q4   Provide a detail classification of soil as per IS. List out and explain about various advantages of irrigation.   (16)

Q5   Summarize in detail about various steps involved in mix designing of concrete.   (16)

Q6   Define local attraction. The following bearings were taken in running a compass traverse. At what stations do you suspect local attraction? Find the correct bearings of the lines and also compute the included angles.   (16)

Line	Fore Bearing (FB)	Back bearing (BB)
AB	124° 30′	304° 30′
BC	68° 15′	246° 00′
CD	310° 30′	135° 15′
DA	200° 15′	17° 45′

1st Semester Regular/Back Examination: 2022-23
Basic Electrical Engineering
AEIE,AUTO,BIOMED,CHEM,CIVIL,CSE,CSEAI,CSEAIME,
CSEDS,CST,ECE,EEE,ELECTRICAL,ELECTRICAL & C.E,ETC,
IT,MECH,METTA,MINING,MME,PT/CE,CSE,EE
Time : 3 Hour
Max Marks : 100
Q.Code : L604

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
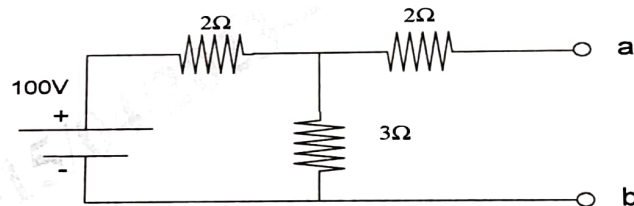from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions :   (2 x 10)

a) Two impedances of (3+j4) Ω and (2-j3) Ω are connected in parallel, what is the
equivalent impedance?

b) Determine the open circuit voltage across the terminals 'a' and 'b' as shown in the
Fig. below.

c) What is the difference between mesh and loop in circuit analysis?

d) Three resistances of 6 Ω each are connected in delta. The value of the resistances
in equivalent star is _____ .

e) In an ac circuit, if supply voltage is $V = 20\angle -30^0$ and circuit current is $I = 10\angle 30^0$,
Calculate the real power.

f) Write the relation between phase and line voltages, and phase and line currents
for a balanced three-phase delta connected load.

g) What do you mean by magnetic hysteresis? Write down the expression of
hysteresis loss.

h) In a 110/220 V,1 kVA, single -phase transformer if supply frequency to HV side is
50 Hz, what is the frequency of emf induced in LV side?

i) A 3 phase,50Hz, 4 pole induction motor is running on full load & runs at 1460 rpm.
Find the slip.

j) What is emf generated in a 4 pole, wave wound dc shunt generator having 294
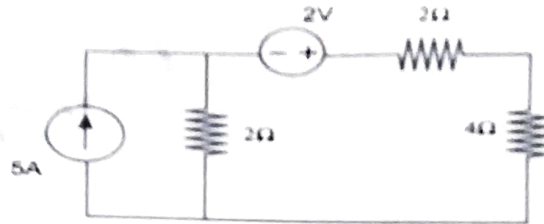
conductors rotating at 1500 rpm & flux per pole is 0.0150 wb

**Q2**   **Only Focused-Short Answer Type Questions-** (Answer Any Eight out of   (6 × 8)
Twelve)

a)   Distinguish between independent and dependent energy sources. Enumerate the various types of dependent sources.

b)   Determine the current in the 4Ω resistor of the circuit shown in fig. below using Thevenin's theorem.

c)   Determine the average and rms value of the below given waveform.
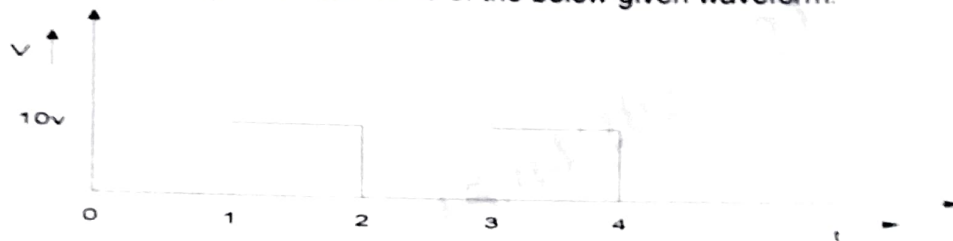
d)   A circuit consists of a resistance R in series with a capacitive reactance of 60 Ω. Determine the value of R for which the power factor of the circuit is 0.8.

e)   A resistance of 50 Ω is connected in series with a pure inductor of 250 mH. The circuit is connected to a 50Hz sinusoidal supply and the voltage across the resistance is 150 V. Calculate the supply voltage.

f)   Two-wattmeter method was used to determine the input power to a three-phase motor. The readings were 5.2 kW and -1.7 kW, and the line voltage was 415V. Calculate (a) the total power (b) the power factor and (c) the line current.

g)   Write the similarities & dissimilarities between electrical & magnetic circuit.

h)   An iron ring (as shown below) of mean length 30 cm has an air gap of 2mm and a winding of 200 turns. If the permeability of the iron core is 300 when a current of 1A flows through the coil, find the flux density.
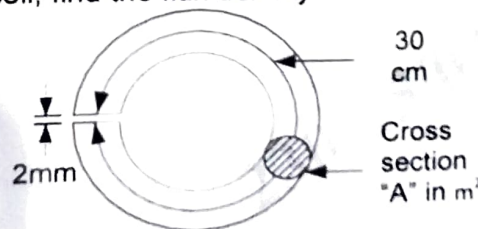
i)   A 6600/440V, 50HZ single phase transformer is built on a core having an effective cross sectional area of 150cm² & has 80 turns in the low voltage winding Calculate (i) The value of the maximum flux density in the core, (ii) The no. of turns in the high voltage winding.

j)   A 3-phase,4 pole induction motor is supplied from 3-phase,50 Hz AC supply.

Calculate (i) synchronous speed (ii) rotor speed when slip is 4% and (iii) rotor frequency when rotor runs at 600 rpm

k) What are the different types of DC generators according to the ways in which fields are excited? Show the connection diagram of each type

l) A 6-pole, dc motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is 0.2 Ω, and flux per pole is 50 mWb. The armature has 864 lap-connected conductors. Calculate (a) the speed, and (b) the gross torque developed by the armature

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Using the node voltage analysis for the circuit shown in Fig. below, find all the node voltages and currents in 1/2Ω, 1/4 Ω and 1/3 Ω resistances. **(16)**
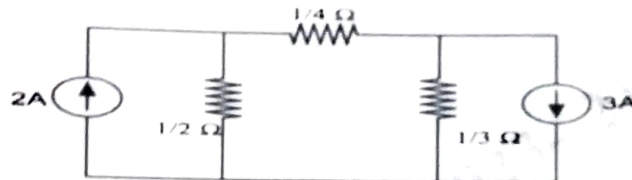
Q4 A balanced star connected load of (6+ j8) Ω per phase is connected to a 3-phase, 50Hz, 415 V supply system. Calculate **(16)**
(i) Line current (ii) Power factor (iii) Real power (iv) Apparent power.

Q5 State the working principle of a transformer. Draw the phasor diagram of an ideal transformer under no load condition. **(16)**

Q6 An 8-pole, dc shunt generator has 778 wave-connected conductors on its armature. While running at 500 rpm, it supplies power to a load of 12.5 Ω at 250 V. The armature and the shunt -field resistances are 0.24 Ω and 250 Ω, respectively. Determine the armature current, the emf induced, and the flux per pole. **(16)**

1st Semester Regular/Back Examination: 2022-23
Basic Electronics Engineering
BRANCH(S): AEIE,AUTO,BIOMED,CHEM,CIVIL,CSE,CSEAI,CSEAIME,
CSEDS,CST,ECE,EEE,ELECTRICAL,ELECTRICAL & C.E,ETC,IT,MECH, METTA,MINING,MME,PT
CE,CSE,EE

Time : 3 Hour
Max Marks : 100
Q.Code : L603

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from
Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: (2 x 10)

a)   Why semiconductor devices are preferred compared to vacuum tube devices?

b)   Convert $(AD)_{16}$ into binary and then to decimal.

c)   Differentiate between zener breakdown and avalanche breakdown.

d)   Define reverse recovery time.

e)   A silicon diode dissipates 2.5 W for a forward current of 1.5 A. Determine the forward
voltage drop across the diode and its bulk resistance.

f)   Why is the collector of transistor made larger and moderately doped?

g)   What is thermal runway?

h)   For a transistor I_C = 6 mA and I_E = 6.35 mA, find I_B ?

i)   List the ideal characteristics of OPAMP.

j)   Differentiate between Enhancement MOSFET and Depletion MOSFET.

Part-II

Q2   Only Focused-Short Answer Type Questions-(Answer Any Eight out of Twelve)   (6 × 8)

a)   Why Silicon is mostly proffered as a Semiconductor material. Explain by giving at least
five reasons?

b)   A centre tapped transformer has a 230 V primary winding and a secondary winding rated at
15V-0-15V and is used in a full wave rectifier circuit with a load of 120 Ω. What is the dc
output voltage, dc load current and the PIV rating required for diodes?

c)   What is the need of transistor biasing? Explain.

d)   A silicon diode has I_s=10nA operating at 25°C. Calculate I_D for a forward bias of 0.6V.

e)   Briefly describe the different regions of output characteristics of transistor in CE mode.

f)   Define bias stability. How the emitter resistance is helpful to improve the bias stability?

g)   It is desirable to have high input impedance for a transistor amplifier, why?

h)   Explain op-amp as Differentiator and Integrator. Also draw the output Waveforms?

i) What is channel length modulation in MOSFET and how it affects the device performance?

j) Design an Op Amp circuit to get the output according to the given expression $V_O = -[0.3V_1 + 3V_2 + V_3]$, where V_1, V_2 and V_3 are the inputs to op-amp.

k) Prove that $A + A'B = A + B$

l) Implement two input XNOR gate using only NOR gates. Use minimum number of gates.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 (a) What is the basis for classifying a material as a conductor, semiconductor, or a dielectric? What is the conductivity of perfect dielectric? **(08)**

(b) Design Zener voltage regulator for the following specifications: Input Voltage=10V±20%, Output Voltage=5V, I_L=20mA, I_{zmin}=5mA and I_{zmax}=80mA. **(08)**

Q4 (a) With a neat circuit diagram explain the voltage divider bias circuit by giving its exact analysis. **(08)**

(b) What is the effect of temperature on the reverse saturation current of a diode? **(08)**

Q5 (a) **(09)**
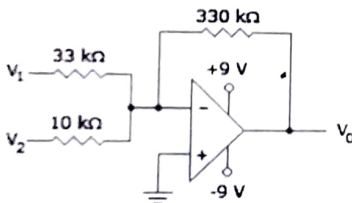
Calculate the output voltage of the circuit given below, if $V_1 = 2V$ and $V_2 = 3V$

(b) Explain the Enhancement and Depletion mode of JFET along with their Transfer Curves. **(07)**

Q6 (a) Design a logic circuit using basic gates with three inputs A, B, C and output Y that goes low only when A is high and B and C are different. **(04)**

(b) Minimize the Boolean expression $F=AB'C'+C'D+BD'+A'C$ using K-map and implement the logic circuit using NAND gates only. **(12)**

1st Sem Exam, 2022
2022-23

1ˢᵗ Semester Regular/Back Examination: 2022-23
Chemistry
BRANCH(S): AE, AEIE, AERO, AG, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MANUTECH, MECH, MINERAL, MINING, MME
Time : 3 Hour
Max Marks : 100
Q.Code : L658
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1　Answer the following questions :　　　　　　　　　　　　　　　(2 x 10)
 a) What are Chromophores?
 b) What is galvanizing?
 c) What are nanomaterials?
 d) What is power alcohol?
 e) Give one example of stress corrosion.
 f) Write the Schrodinger wave equation.
 g) What is cracking?
 h) What is producer gas?
 i) State phase rule.
 j) What are solid fuels?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of (6 × 8)
  Twelve)
 a) Discuss the principles and application of vibrational spectroscopy.
 b) Write a short note on gaseous fuel.
 c) Write a short note on cathodic protection.
 d) Explain phase diagram of sulfur system.
 e) Write the basic postulates of quantum mechanics.
 f) Calculate the energy of a particle in one dimensional box of length 'a'. Also set up the Schrodinger wave equation for the same.
 g) Write a short note on effect of conjugation on chromophores.
 h) Discuss the application of nano materials in electronic devices.
 i) Classify the nano materials based on the size of particles and distinguish between 0D, 1D and 2D nano materials.
 j) What is the difference between producer gas and water gas?
 k) What is calorific value of a fuel? How it is determined by Dulong's formula?

I)   How G.C.V. and N.C.V. of a fuel is calculated?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Explain top-down and bottom-up approaches of nanomaterial synthesis. Give one   **(16)**
method of synthesis of nanomaterials via green synthetic route.

Q4   Explain electrochemical theory of corrosion with suitable example. What are the   **(16)**
conditions for electrochemical corrosion?

Q5   Discuss the phase diagram of Pb-Sn system.   **(16)**

Q6   Briefly discuss the Lambert Beer's law and discuss its application in analyzing   **(16)**
samples by UV-Visible spectroscopy.

1ˢᵗ Semester Regular/Back Examination: 2022-23
Communicative English
BRANCH(S): AE, AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CSEAI,
CSEAIME, CSEDS, CSIT, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E,
ELECTRONICS & C.E, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME,
PLASTIC, PT,
CE, CSE, ECE, EE, ME
Time: 3 Hour
Max Marks: 100
Question Code: L635

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1   Answer the following questions: (2 x 10)

a)   Write a short note on Communication Channel
b)   Neither the cat nor the dogs is going to the yard (Correct the sentence)
c)   Identify two problem sounds of Indian speakers of English.
d)   Explain with examples (two) consonant clusters
e)   What are the neutral substitutes of "Nigro" and "Lady Doctor"
f)   What, according to you is the most important factor influencing the effectiveness of
     a presentation?
g)   The subject line of an official email carries much value. Do you agree? Why?
h)   Write a short note on the executive summary of a business report.
i)   GD has a moderator (true/false)
j)   Briefly define leadership skills.

Part-II

Q2   Only Focused-Short Answer Type Questions (Answer Any Eight out of   (6 × 8)
      Twelve)

a)   Audience and purpose play a major role in a communication process. How?
b)   Comment briefly on kinesics as a potential non-verbal communication
c)   Discuss physical barriers in communication.
d)   With examples explain any six diphthongs
e)   Transcribe the following words: cat, boy, stupid, sense, like and first
f)   What is contrastive stress? Explain briefly with examples.
g)   Effective business presentation in workplace can lead to winning situations. How?

h) Write a short note on functional CV.
i) Mention the differences between a notice and a circular.
j) Communication skills and body language are complimentary to each other. Do you agree? How?
k) While preparing for a business PPT we should pay attention to several aspects of it. According to you what are the most important of them?
l) Define active listening in communication.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Discuss in detail the various factors involved in the process of communication.   (16)

Q4   How many consonant sounds are available in RP in English? Discuss with examples.   (16)

Q5   Write a proposal to build a sports complex in your campus for students which is to be submitted to the principal/director of your institution   (16)

Q6   Prepare a reverse chronological CV of your own for the position of Design Engineer in L&T, India.   (16)

1st Semester Regular/Back Examination: 2022-23
Mathematics - I
BRANCH(S): All branches
CE, CSE, ECE, EE, ME (Integrated Dual Degree)
Time : 3 Hour
Max Marks : 100
Q.Code : L646

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions : (2 x 10)

a) Find the asymptotes of the curve $y = \dfrac{x^2}{x^2 + 1}$ parallel to the x-axis

b) What is the curvature of the circle $x^2 + y^2 = 4$ at the point $(2, 0)$?

c) What is the value of $\beta(2,3)$?

d) When the differential equation $M(x, y)dx + N(x, y)dy = 0$ is exact?

e) Solve the differential equation $\dfrac{dy}{dx} = \sin x$.

f) Write the solution of a 2nd order homogeneous ODE if the roots of the auxiliary (characteristic) equation are $\lambda = 1 + 2i$ & $1 - 2i$.

g) Let the roots of the auxiliary (characteristic) equation of $y'' + ay' + by = e^{2x}$ are 2 and 3. Then what is the choice for $y_p(x)$ for this equation?

h) Under what conditions a function $f(t)$, defined for $t > 0$ will have a Laplace transform?

i) What is the Laplace transform of the unit step function $u(t - a)$?

j) What is Laplace inverse of $\dfrac{1}{(s-1)(s-2)}$?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 × 8)

a) Find all the asymptotes of the curve $y(y-1)^2 - x^2 y = 0$.

b) Show that $3\sqrt{3}/2$ is the least value of the $|\rho|$ for $y = \ln x$.

c) Show that $\beta(p+1,q) + \beta(p,q+1) = \beta(p,q)$.

d) Solve $xy' = \dfrac{1}{2}y^2 + y$.

e) Solve $x^3 y' + 3x^2 y - 1 = 0$, $y(1) = -1$.

f) Solve $y'' - 2y' - 3y = 0$, $y(0) = 2$, $y'(0) = 14$

g) Solve $y'' - 4y' + 4y = x^2 e^x$.

h) Solve $y' = y + x$ by power series method.

i) Show that $J_0'(x) = -J_1(x)$.

j) Solve $y'' + 2y' + 2y = 0$, $y(0) = 1$, $y'(0) = -3$ by Laplace transform.

k) Find out the given convolution. $\sin t * \cos t$.

l) Solve the integral equation $y(t) + \displaystyle\int_0^t (t - \tau)y(\tau)d\tau = 1$.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Find the absolute maxima and minima of the function $f(x, y) = x^2 + xy + y^2 - 6x + 2$ on the rectangular region $0 \le x \le 5$, $-3 \le y \le 0$. **(16)**

Q4 Solve $y'' + 4y = 16\cos 2x$, $y(0) = 0$, $y'(0) = 0$ **(16)**

Q5 Solve $y'' - y' + xy = 0$ by power series method. **(16)**

Q6 Solve $y'' + 2y' + 2y = e^{-t} + 5\delta(t - 2)$, $y(0) = 0$, $y'(0) = 1$ **(16)**

1ˢᵗ Semester Regular/Back Examination: 2022-23
Physics
BRANCH(S): AE, AEIE, AG, BIOTECH, CIVIL, CSE, CSEAI, CSEAIME, CSEDS, CSIT, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MANUTECH, MECH, METTA, MINING, MME, PLASTIC, PT
CE, CSE, EE
Time : 3 Hour
Max Marks : 100
Q.Code : L657

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

(2 x 10)

Q1 Answer the following questions :

a) The maximum amplitude of a forced damped oscillator is 1.5 cm. What will be the maximum amplitude if damping constant and magnitude of driving force are doubled?

b) The total energy of a simple harmonic oscillator is 1.2 ergs. Find its kinetic energy at the mid-point of the mean position and one extreme end.

c) State the conditions for sustained interference.

d) Write two uses of Newton's rings experiment.

e) Distinguish between spontaneous emission and stimulated emission.

f) Calculate the inter-planer spacing for a (321) plane in a simple cubic lattice whose lattice constant is 0.42 nm.

g) Distinguish between conduction current and displacement current.

h) State Gauss divergence theorem in vector field.

i) In Compton effect, a photon recoils back after striking an electron at rest. What is the change in wavelength of the photon?

j) The energy required to remove an electron from sodium is 3.1 eV. Does sodium show a photoelectric effect for orange light with λ= 680 nm? Justify.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 × 8)

a) A damped oscillator is subjected to a damping force proportional to its velocity. Write the differential equation of motion of the oscillator and discuss the under-damped, over-damped and critically damped motions with suitable diagram.

b) Define coupled oscillation. In a coupled oscillation of two identical pendulums of mass **100 gm** and length **100 cm** each connected by a spring of spring constant **300 dyne/cm**. Calculate the frequency in the out-of-phase mode.

c) With a suitable ray diagram explain the formation of Newton's rings. Why the fringes in Newton's rings interference pattern are circular?

d) What is a zone plate? Compare a zone plate with a convergent lens

e) Draw the structure of an optical fiber. Distinguish between a single mode and a

multimode optical fiber

f) Write Bragg's law of X-ray diffraction. State its significance. A beam of X-rays of wavelength **0.073 nm** is diffracted by **(110)** plane of rock salt with lattice constant of **0.3 nm**. Find the glancing angle for the second-order diffraction.

g) State Ampere's circuital law. Obtain its differential form.

h) State and explain Poynting theorem. Write the direction and S.I unit of the Poynting vector.

i) The electromagnetic wave is propagating in free space with electric vector

$$E(z,t) = 50\cos(4 \times 10^7 t - Kz)\hat{\imath} \text{ volt/meter}$$ Obtain an expression for magnetic vector. State the direction of propagation of the electromagnetic wave.

j) What is pair production? Does it violate conservation of momentum? Find the threshold energy of the photon required to produce pair production.

k) Define probability density. Calculate the probability of finding a particle in the region $2 \leq x \leq 4$, if the wave function for the particle is given by $\psi(x) = 0.25\, e^{2ix}$.

l) What are matter waves? If the ratio of the velocities of proton and α-particle is 8:1 then find the ratio of their de - Broglie wavelengths.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 (a) Define diffraction. Derive an expression for the intensity incase of Fraunhofer's diffraction due to single slit with a neat diagram. Discuss the conditions for principal maximum, minima and secondary maxima. Draw its intensity distribution curve. **(12)**

(b) In Fresnel's biprism experiment, the width of 10 fringes is **2 cm** which are formed at a distance of **2 meter** from the slit. If the wavelength of light is **540 nm**, then find the distance between two coherent sources. **(4)**

Q4 (a) Write the four Maxwell's equations in differential form in vacuum. Discuss the significance of each Maxwell's equation **(8)**

(b) Derive the electromagnetic wave equation in terms of electric vector when the wave is propagating in a charge free non-conducting medium. Obtain an expression for its velocity. Find the impendence of vacuum **(8)**

Q5 (a) With a suitable diagram explain the construction and working of ruby laser. Draw the energy level diagram showing the operation of the ruby laser. Write the limitations of ruby laser. **(12)**

(b) A Ruby laser emits light of **693.95 nm** wavelength. If **1 mole** of Cr^{+3} ions are involved in the lasing process, calculate the pulse energy in eV. **(4)**

Q6 (a) Starting from the Schrodinger's equation for a particle confined in a one dimensional box of infinite height, develop an expression for the normalized wave function. Show that its energy is discrete and quantized **(10)**

(b) An electron is trapped in a one-dimensional box of length 2 A. How much energy is required to excite the electron from the first excited state to the third excited state? Find the de-Broglie's wavelength of the electron in the 3rd excited state. **(6)**