



PAPER ID-311172

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Subject Code: KAS101T

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**B. TECH.**  
**(SEM 1) THEORY EXAMINATION 2020-21**  
**ENGINEERING PHYSICS**

**Time: 3 Hours****Total Marks: 100****Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Qno.	Question	Marks	CO
a.	State Einstein's postulates of Special Theory of Relativity.	2	1
b.	Find the momentum of a photon having energy $1.00 \times 10^{-17}$ J.	2	1
c.	What is Displacement Current?	2	2
d.	Show that magnetic monopoles do not exist.	2	2
e.	State Wien's displacement law and Rayleigh-Jeans law.	2	3
f.	Why are matter waves associated with a particle generated only when it is in motion?	2	3
g.	Two independent sources of light cannot produce interference, why?	2	4
h.	State Rayleigh criterion of Resolution. Also define resolving power.	2	4
i.	Differentiate between spontaneous and stimulated emission.	2	5
j.	With the help of a well-labelled diagram, name the components of an optical fibre.	2	5

**SECTION B****2. Attempt any three of the following:**

Qno.	Question	Marks	CO
a.	Show that space-time interval between two events remains invariant under Lorentz transformations.	10	1
b.	Find the conduction current density and displacement current density for a solid with conductivity, $\sigma = 10^{-3}$ S/m and $\epsilon_r = 2.5$ . Electric field intensity, $E = 4.5 \times 10^{-6} \sin(10^9 t)$ .	10	2
c.	Find the two lowest permissible energy states for an electron which is confined in a one dimensional infinite potential box of width $3.5 \times 10^{-9}$ m.	10	3
d.	Calculate the thickness of a soap bubble thin film that will result in constructive interference in reflected light. The film is illuminated with light of wavelength 5000 Å and the refractive index of the film is 1.45.	10	4
e.	What do you understand by attenuation and dispersion in an optical fibre. A communication system uses a 25 km long fibre having a loss of 2.5 dB/km. The input power is 2500 μW, compute the output power.	10	5

**SECTION C****3. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	What do you mean by time dilation? Explain with the help of a mathematical proof. Justify with an experimental evidence to show that time dilation is a real effect.	10	1



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b.	Derive Einstein's mass-energy relation and show that relativistic kinetic energy of a particle is given by: $k = (m - m_0)c^2 = m_0c^2 \left[ \left( 1 - \frac{v^2}{c^2} \right)^{-\frac{1}{2}} - 1 \right]$	10	1
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4. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Write Maxwell's equations in free space. Also show that the electric and magnetic vectors are normal to the direction of propagation of the electromagnetic wave.	10	2
b.	State and deduce Poynting theorem for the flow of energy in an electromagnetic field. Discuss the physical significance of Poynting theorem.	10	2

5. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	What is wave function? Derive time independent Schrodinger wave equation.	10	3
b.	What is Compton effect? Derive an expression for Compton shift.	10	3

6. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Describe the formation of Newton's rings in monochromatic light. Show that in reflected light, the diameters of dark rings are proportional to the square roots of natural numbers.	10	4
b.	What is a diffraction grating? Discuss the phenomenon of diffraction due to plane diffraction grating.	10	4

7. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Illustrate the construction and working of He-Ne laser? Discuss important applications of laser.	10	5
b.	Derive expressions for acceptance angle and numerical aperture.	10	5







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**BTECH**  
**(SEM III) THEORY EXAMINATION 2021-22**  
**FLUID MECHANICS**

**Time: 3 Hours****Total Marks: 100****Note: 1. Attempt all Sections. If require any missing data; then choose suitably.****SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Distinguish between gauge pressure and absolute pressure.	2	1
b.	What do you mean by Newtonian and non-Newtonian fluids?	2	1
c.	What is meta centric height? How is it determined?	2	1
d.	Define velocity potential function.	2	2
e.	Explain difference between Siphon and a Normal Tube.	2	2
f.	Differentiate between free and forced vortex	2	3
g.	Describe major and minor losses in pipes.	2	3
h.	Define the displacement thickness.	2	4
i.	What do you mean by 'Dimensional Analysis'?	2	5
j.	Explain bluff and streamlined body.	2	5

**SECTION B****2. Attempt any three of the following:****3 x 10 = 30**

Q no.	Question	Marks	CO
a.	An oil tanker of $2.5 \times 2.5$ m square cross section is 4 m long. Oil is filled upto a depth of 2m. At what acceleration is the direction of its length the tanker be moved so that the corner A is exposed? What is then the net horizontal force acting on the tanker sides? Take sp. gr. of oil as 0.8.	10	1
b.	Calculate the stream function for the given data: (i) Velocity components; $u = x - 4y$ and $v = -y - 4x$ (ii) velocity potential function $\phi = 4x(3y - 4)$ .	10	2
c.	Calculate the discharge of water flowing through a pipe of 30 cm diameter placed in an inclined position where a venturi meter is inserted, having a throat diameter of 15 cm. The difference of pressure between the main and the throat is measured by a liquid of specific gravity 0.6 in an inverted U-tube which gives a reading of 30 cm. The loss of head between the main and the throat is 0.2 times the kinetic head of the pipe.	10	3
d.	Derive the momentum thickness for velocity distribution on the boundary layer given below- $\frac{u}{v} = \frac{3}{2}\eta - \eta^2$ Where $\eta = y/\delta$	10	4
e.	The variables controlling the motion of floating vessel through water are the drag force F, the speed V, the length L, the density d, dynamic viscosity $\mu$ of water and acceleration due to gravity g. Determine the expression for F by dimensional analysis.	10	5

**SECTION C****3. Attempt any one part of the following:****1 x 10 = 10**

Q no.	Question	Marks	CO
a.	A tank contains water up to the height of 5 m above the base. An immiscible liquid of specific gravity 0.9 is filled on the top of the water up to 1m height. Calculate total pressure on one side of the tank and the position of center of pressure	10	1

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**BTECH**  
**(SEM III) THEORY EXAMINATION 2021-22**  
**FLUID MECHANICS**

b.	Derive an expression for the depth of centre of pressure from free surface of a liquid of an inclined plane surface submerged into the liquid	10	1
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**4. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate velocity potential and stream function. Show that 3 D continuity equation for 3 D flow in Cartesian coordinates is given by $\frac{\partial \rho}{\partial t} + \frac{\partial(\rho u)}{\partial x} + \frac{\partial(\rho v)}{\partial y} + \frac{\partial(\rho w)}{\partial z} = 0$	10	2
b.	The velocity potential function is given by an expression $\phi = -\frac{xy^3}{3} - x^2 + \frac{yx^3}{3} + y^2$ (i) Find the velocity component in x and y direction. (ii) Show that $\phi$ represent a possible case of flow. (iii) Find Stream function.	10	2

**5. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Derive Euler's equation of motion. Also derive the Bernoulli's equation from Euler's equation and mention the necessary assumptions for this equation.	10	3
b.	Describe: (i) Stream-lined body and bluff body (ii) Darcy-weisbach formula and chezy's formula (iii) Equivalent pipe and compound pipe (iv) Hydraulic gradient line and total energy line (v) Reynold's number and Euler's number.	10	3

**6. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate Prandtl mixing length concept to describe the turbulence during the fluid flows at high Reynold's number.	10	4
b.	A pipe carrying water has average height of roughness of 0.48mm. The diameter of pipe is 0.6 mm, length is 4.5 m. The discharge of water is 0.6 m <sup>3</sup> /sec. Determine the power required to maintain the flow if $\mu = 10^{-3}$ N-sec/m <sup>2</sup> Use the relation $\frac{1}{\sqrt{f}} = 2 \log_{10} \left( \frac{R}{k} \right) + 1.74$	10	4

**7. Attempt any one part of the following: 1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Illustrate terminal velocity of the body. Also illustrate the drag on a sphere and on a cylinder.	10	5
b.	Discuss geometric, kinematic and dynamic similarity. Are the above equations obtainable?	10	5







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**BTECH**  
**(SEM I) THEORY EXAMINATION 2021-22**  
**PHYSICS**

**Time: 3 Hours****Total Marks: 100****Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Qno.	Question	Marks	CO
a.	What is inertial and non-inertial frame of references?	2	1
b.	Show that the massless particle can exist only if they move with the speed of light and their energy E and momentum p must have the relation $E = pc$ .	2	1
c.	Write Maxwell's equations in non-conducting medium.	2	2
d.	Define skin depth.	2	2
e.	Distinguish electromagnetic waves and matter waves?	2	3
f.	What is de-Broglie hypothesis?	2	3
g.	What are coherent sources?	2	4
h.	State Rayleigh's criterion of resolution.	2	4
i.	Explain the propagation mechanism of optical fiber.	2	5
j.	What are the main components of laser?	2	5

**SECTION B****2. Attempt any three of the following:**

Qno.	Question	Marks	CO
a.	What is length contraction? Derive the necessary expression for it. Show that $x^2 + y^2 + z^2 - c^2 t^2$ is invariant. under Lorentz transformation.	10	1
b.	Show that the radiation pressure exerted by an electromagnetic wave is equal to the energy density. For a medium, conductivity $\sigma = 58 \times 10^6$ seimen/m, $\epsilon_r = 1$ . Find out the conduction and displacement current densities if the magnitude of electric field intensity is given by $E = 150 \sin(10^{10} t)$ Volt/m.	10	2
c.	Define wave function with its physical significance. Derive Schrodinger's time independent wave equation.	10	3
d.	Prove that reflection and transmission are complimentary in thin film interference.	10	4
e.	Develop the expressions for acceptance angle and numerical aperture of an optical fiber. A step index fiber has core refractive index 1.466, cladding refractive index 1.46. If the operating wavelength of the rays is $0.85 \mu\text{m}$ , calculate the cut - off parameter and the number of modes, which the fibre will support. The diameter of the core = $50 \mu\text{m}$ .	10	5

**SECTION C****3. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	By using Lorentz transformation equations, derive time dilation. Show that time dilation is a real effect.	10	1
b.	Derive Einstein's mass-energy relation Calculate the amount of work to be done to increase the speed of an electron from $0.6c$ to $0.8c$ . Given that the rest mass energy of electron = $0.5 \text{ MeV}$ .	10	







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**(SEM I) THEORY EXAMINATION 2021-22**  
**PHYSICS**

**4. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	Derive the Poynting or work-energy theorem for the flow of energy in an electromagnetic field. Also give the physical interpretation.	10	2
b.	With the help of Maxwell's equations for free space, derive electromagnetic wave equation in free space and prove that electromagnetic waves are transverse in nature.	10	2

**5. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	Solve Schrodinger's wave equation for a particle in one dimensional infinite potential box. Compute the energy difference between the ground state & the first excited state for an electron in a one-dimensional rigid box of length 100 Å.	10	3
b.	Define Compton effect and apply it to find an expression for the Compton shift ( $\Delta\lambda$ ).	10	3

**6. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	Explain and describe the formation of Newton's rings in reflected light. Solve it for reflected light to prove that the diameters of dark rings are proportional to the square roots of natural numbers. Light of wavelength 6000 Å falls normally on a thin wedge-shaped film of refractive index 1.4 forming fringes that are 2.0 mm apart. Find the angle of wedge in seconds.	10	4
b.	Discuss single slit Fraunhofer's diffraction and make use to show that the relative intensities of successive maximum are nearly 1: 1/22 : 1/62 : 1/121:....	10	4

**7. Attempt any one part of the following:**

Qno.	Question	Marks	CO
a.	With the help of diagram, classify and describe various types of optical fibers based on modes and core refractive index.	10	5
b.	With the help of diagram describe the process of spontaneous and stimulated emission of radiation. Also obtain an expression for Einstein's coefficients of spontaneous and stimulated emission of radiation. Analyze the value of population of two states in He-Ne laser that produces light of wavelength 6000 Å at 27°C.	10	5





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**B.TECH**  
**(SEM I) THEORY EXAMINATION 2020-21**  
**ENGINEERING MATHEMATICS-I**

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2 x 10 = 20

Qno.	Question	Marks	CO
a.	Prove that the matrix $\frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$ is unitary.	2	1
b.	State Rank-Nullity Theorem.	2	1
c.	State Rolle's Theorem.	2	2
d.	Discuss all the symmetry of the curve $x^2y^2 = x^2 - a^2$	2	2
e.	If $u = f(y-z, z-x, x-y)$ , prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$	2	3
f.	If $x = e^v \sec u$ , $y = e^v \tan u$ , then evaluate $\frac{\partial(x,y)}{\partial(u,v)}$ .	2	3
g.	Evaluate $\int_0^1 \int_0^{x^2} e^{y/x} dy dx$ .	2	4
h.	Calculate the volume of the solid bounded by the surface $x=0$ , $y=0$ , $x+y+z=1$ and $z=0$ .	2	4
i.	Show that the vector $\vec{V} = (x+3y)\hat{i} + (y-3z)\hat{j} + (x-2z)\hat{k}$ is solenoidal.	2	5
j.	State Green's theorem.	2	5

**SECTION B**

2. Attempt any three of the following:

Qno.	Question	Marks	CO
a.	Find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$	10	1
b.	If $y = e^{\tan^{-1}x}$ , prove that $(1+x^2)y_{n+2} + [(2n+2)x-1]y_{n+1} + n(n+1)y_n = 0$ .	10	2
c.	If $u^3 + v + w = x + y^2 + z^2$ , $u + v^3 + w = x^2 + y + z^2$ , $u + v + w^3 = x^2 + y^2 + z$ , Show that: $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{1 - 4xy(xy + yz + zx) + 16xyz}{2 - 3(u^2 + v^2 + w^2) + 27u^2v^2w^2}$	10	3
d.	Evaluate by changing the variables, $\iint_R (x+y)^2 dx dy$ where R is the region bounded by the parallelogram $x+y=0$ , $x+y=2$ , $3x-2y=0$ and $3x-2y=3$ .	10	4
e.	Use divergence theorem to evaluate the surface integral $\iint_S (x dy dz + y dz dx + z dx dy)$ where S is the portion of the plane $x+2y+3z=6$ which lies in the first octant.	10	5



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## SECTION C

## 3. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Find non-singular matrices P and Q such that PAQ is normal form. $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$	10	1
b.	Find the eigen values and the corresponding eigen vectors of the following matrix. $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{bmatrix}$	10	1

## 4. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Find the envelope of the family of lines $\frac{x}{a} + \frac{y}{b} = 1$ , where a and b are connected by the relation $a^n + b^n = c^n$	10	2
b.	If $y = \sin(m \sin^{-1}x)$ , find the value of $y_n$ at $x=0$ .	10	2

## 5. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Divide 24 into three parts such that continued product of first, square of second and cube of third is a maximum.	10	3
b.	If $u = \sec^{-1}\left(\frac{x^3 - y^3}{x+y}\right)$ , prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \cot u$ . Also evaluate $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$ .	10	3

## 6. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	Evaluate the following integral by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx.$	10	4
b.	A triangular thin plate with vertices (0,0), (2,0) and (2,4) has density $\rho = 1 + x + y$ . Then find: (i) The mass of the plate. (ii) The position of its centre of gravity G.	10	4

## 7. Attempt any one part of the following:

Qno.	Question	Marks	CO
a.	A fluid motion is given by $\vec{v} = (y \sin z - \sin x)\hat{i} + (x \sin z + 2yz)\hat{j} + (xy \cos z + y^2)\hat{k}$ . Is the motion irrotational? If so, find the velocity potential.	10	5
b.	Verify Stoke's theorem for the function $\vec{F} = x^2\hat{i} + xy\hat{j}$ integrated round the square whose sides are $x=0, y=0, x=a, y=a$ in the plane $z=0$ .	10	5







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**BTECH**  
**(SEM I) THEORY EXAMINATION 2021-22**  
**ENGINEERING MATHEMATICS-I**

**Time: 3 Hours****Total Marks: 100****Notes:**

- Attempt all Sections and Assume any missing data.
- Appropriate marks are allotted to each question, answer accordingly.

SECTION-A	Attempt All of the following Questions in brief	Marks(10X2=20)
Q1(a)	If the matrix $A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$ , then find the eigen value of $A^3 + 5A + 8I$ .	1
Q1(b)	Reduce the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ into normal form and find its rank.	1
Q1(c)	Find the envelope of the family of straight line $y = mx + \frac{a}{m}$ , where m is a parameter.	2
Q1(d)	Can mean value theorem be applied to $f(x) = \tan x$ in $[0, \pi]$ .	2
Q1(e)	State Euler's Theorem on homogeneous function.	3
Q1(f)	Find the critical points of the function $f(x, y) = x^3 + y^3 - 3axy$ .	3
Q1(g)	Find the area bounded by curve $y^2 = x$ and $x^2 = y$ .	4
Q1(h)	Find the value of $\int_0^1 \int_0^x \int_0^{x+y} dx dy dz$ .	4
Q1(i)	Find a unit normal vector to the surface $z^2 = x^2 + y^2$ at the point $(1, 0, -1)$ .	5
Q1(j)	State Stoke's Theorem.	5

SECTION-B	Attempt ANY THREE of the following Questions	Marks(3X10=30)
Q2(a)	Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ , compute $A^{-1}$ and prove that $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I = \begin{bmatrix} 8 & 5 & 5 \\ 0 & 3 & 0 \\ 5 & 5 & 8 \end{bmatrix}$ .	1
Q2(b)	State Rolle's theorem and verify Rolle's theorem for the function $f(x) = \frac{\sin x}{e^x}$ in $[0, \pi]$ .	2
Q2(c)	If u, v and w are the roots of $(\lambda - x)^3 + (\lambda - y)^3 + (\lambda - z)^3 = 0$ , cubic in $\lambda$ , find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ .	3
Q2(d)	Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the plane $y + z = 4$ and $z = 0$ .	4
Q2(e)	Apply Green's theorem to evaluate $\int_C [(2x^2 - y^2)dx + (x^2 + y^2)dy]$ , where C is the boundary of the area enclosed by the x-axis and the upper half of the circle $x^2 + y^2 = a^2$ .	5

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q3(a)	Find the value of k for which the system of equations $(3k - 8)x + 3y + 3z = 0$ , $3x + (3k - 8)y + 3z = 0$ , $3x + 3y + (3k - 8)z = 0$ has a non-trivial solution.	1
Q3(b)	Find the eigen values and eigen vectors of matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$ .	1





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**ENGINEERING MATHEMATICS-I**

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q4(a)	If $f(x) = \frac{x}{1+e^x}$ ; $x \neq 0$ and $f(0) = 0$ , then show that the function is continuous but not differentiable at $x = 0$ .	2
Q4(b)	If $y = (x \sqrt{1+x^2})^m$ , find $y_n(0)$ .	2

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q5(a)	Expand $x^y$ in powers of $(x - 1)$ and $(y - 1)$ up to the third-degree terms and hence evaluate $(1.1)^{1.02}$ .	3
Q5(b)	A rectangular box which is open at the top having capacity 32c.c. Find the dimension of the box such that the least material is required for its constructions.	3

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q6(a)	Change the order of integration in $I = \int_0^1 \int_{x^2}^{2-x} xy dy dx$ and hence evaluate the same.	4
Q6(b)	Find the position of the C.G. of a semicircular lamina of radius, $a$ if its density varies as the square of the distance from the diameter.	4

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q7(a)	Find the directional derivative of $\nabla(\nabla f)$ at the point $(1, -2, 1)$ in the direction of the normal to the surface $xy^2z = 3x + z^2$ where $f = 2x^3y^2z^4$ .	5
Q7(b)	Find the constants $a, b$ , so that $\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is irrotational and hence find function $\phi$ such that $\vec{F} = \nabla\phi$ .	5







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**BTECH**  
**(SEM II) THEORY EXAMINATION 2021-22**  
**ENGINEERING PHYSICS**

**Time: 3 Hours****Total Marks: 100****Notes:**

- Attempt all Sections and assume any missing data.
- Appropriate marks are allotted to each question, answer accordingly.

SECTION-A	Attempt All of the following Questions in brief	Marks(10X2=20)
Q1(a)	What is frame of reference in motion?	1
Q1(b)	Show that massless particles can exist only if they move with the speed of light and their energy $E$ and momentum $p$ must have the relation $E=pc$ .	1
Q1(c)	In an electromagnetic wave, the electric and magnetic fields are 100V/m and 0.265A/m. What is the maximum energy flow	2
Q1(d)	Define the concept of Skin depth for high and low frequency waveforms.	2
Q1(e)	What is Compton effect and Compton shift?	3
Q1(f)	Why is black the best emitter?	3
Q1(g)	Why the center of Newton's ring in reflected system is dark?	4
Q1(h)	Explain Rayleigh's criterion of resolution.	4
Q1(i)	What do you mean by acceptance angle and cone for an optical fiber?	5
Q1(j)	Differentiate spontaneous emission and stimulated emission.	5

SECTION-B	Attempt ANY THREE of the following Questions	Marks(3X10=30)
Q2(a)	What is special theory of relativity? Derive Lorentz transformation equation.	1
Q2(b)	Assuming that all the energy from a 1000 watt lamp is radiated uniformly; calculate the average values of the intensities of electric and magnetic fields of radiation at a distance of 2m from lamp.	2
Q2(c)	Calculate the energy difference between the ground state and the first excited state for an electron in a one-dimensional rigid box of length $25\text{\AA}$ .	3
Q2(d)	Newton's rings are observed in reflected light of wavelength $5900\text{\AA}$ . The diameter of 10 <sup>th</sup> dark ring is 0.50cm. Find the radius of curvature of the lens.	4
Q2(e)	A step index fibre has $\mu_1 = 1.466$ and $\mu_2 = 1.46$ where $\mu_1$ and $\mu_2$ are refractive indices of core and cladding respectively. If the operating wavelength of the rays is $0.85\text{ }\mu\text{m}$ and the diameter of the core = $50\text{ }\mu\text{m}$ , calculate the cut-off parameter and the number of modes which the fibre will support.	5

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q3(a)	What was the object of conducting Michelson-Morley experiment? Illustrate the experiment with proper diagram and necessary mathematical derivations. Also state the outcomes.	1
Q3(b)	Deduce Einstein's mass-energy relation $E=mc^2$ . Give some evidence showing its validity.	1

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q4(a)	Deduce the Maxwell's equations for free space and prove that electromagnetic waves are transverse in nature.	2
Q4(b)	Define radiation pressure and momentum of electromagnetic wave. Also determine an expression for radiation pressure and momentum.	2







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**BTECH**  
**(SEM II) THEORY EXAMINATION 2021-22**  
**ENGINEERING PHYSICS**

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q5(a)	What is the physical significance of a wave function? Derive Schrodinger time independent wave equation.	3
Q5(b)	What is Compton effect? Deduce an expression for Compton shift.	3

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q6(a)	What is Rayleigh criterion of resolution how one can increase the resolving power of a diffraction grating? Using Rayleigh criterion for just resolution show that the resolving power of grating is equal to $nN$ , where $n$ is the order of the spectrum, and $N$ is total no of lines on the grating.	4
Q6(b)	Discuss the phenomena of Fraunhofer diffraction at a single slit and show that the relative intensities of the successive maximum are nearly 1: $4/9\pi^2$ : $4/25\pi^2$ : $4/49\pi^2$ : .....	4

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q7(a)	A silicon optical fibre with a core diameter large enough has a core refractive index of 1.50 and a cladding refractive index 1.47. Determine (i) the critical angle at the core cladding interface, (ii) the numerical aperture for the fibre (iii) the acceptance angle in air for the fibre.	5
Q7(b)	What do you mean by population inversion? Describe the principle and working of Ruby laser system with the help of neat diagram.	5

