Code No: 131AB

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May - 2018
MATHEMATICS-II
(Common to CE, ME, MCT, MMT, AE, MIE, PTM, CEE, MSNT)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find $L\{\cos^3 2t\}$. [2]

b) Find $L^{-1}\left\{\frac{4}{(s+1)(s+2)}\right\}$. [3]

c) Evaluate $\int_0^1 x^7(1-x)^5\,dx$. [2]

d) Evaluate $\int_0^\infty x^4 e^{-x^2}\,dx$. [3]

e) Evaluate $\int_0^1\int_0^{\sqrt{x}} xy\,dy dx$. [2]

f) Evaluate $\int_{-1}^{1}\int_{-2}^{2}\int_{-3}^{3} dx\,dy\,dz$. [3]

g) If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ then find $div\,\bar{r}$. [2]

h) State Green's theorem on a plane. [3]

i) Evaluate $\nabla(x^2 - yz + z^2)$. [2]

j) If $\bar{a}$ is a constant vector then find $curl(\bar{r}\times\bar{a})$. [3]

PART - B

(50 Marks)

2.a) Find $L\{te^{2t}\sin 3t\}$.

b) Find $L^{-1}\left\{\frac{s^2}{(s^2+4)(s^2+25)}\right\}$. [5+5]

OR

3. Solve the differential equation $\frac{d^2x}{dt^2} + 9x = \sin t$ using Laplace transform, given that $x(0) = 1,\ x\left(\pi/2\right) = 1$. [10]

4. Prove that $\beta(m,n)=\dfrac{\Pi(m).\Pi(n)}{\Pi(m+n)}$. [10]

OR

5. Show that $\beta\left(m,\tfrac{1}{2}\right)=2^{2m-1}\beta(m,m)$. [10]

6. Change the order of integration and solve $\int_0^a\int_{x^2/a}^{2a-x} xy^2\,dydx$. [10]

OR

7. Find the area of the loop of the curve $r=a(1+\cos\theta)$. [10]

8.a) Prove that $\nabla.(\bar{A}\times\bar{B})=\bar{B}.(\nabla\times\bar{A})-\bar{A}.(\nabla\times\bar{B})$.

b) Find the directional derivative of $2x^2+z^2$ at (1, -1, 3) in the directional of $\bar{i}+2\bar{j}+3\bar{k}$. [5+5]

OR

9. Show that $\nabla^2[f(r)]=f''(r)+\tfrac{2}{r}f'(r)$ where $r=|\bar{r}|$. [10]

10. Verify Green's theorem for $\int_C (xy+y^2)\,dx+x^2dy$ where 'C' is bounded by $y = x$ and $y=x^2$. [10]

OR

11. Verify the Stoke's theorem for $\bar{F}=y\bar{i}+z\bar{j}+x\bar{k}$ and surface is the part of the plane $x^2+y^2+z^2=1$ above the xy - plane. [10]

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R16

Code No: 131AH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May - 2018
ENGINEERING PHYSICS-I
(Common to EEE, ECE, CSE, EIE, IT, ETM)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a)	Explain basic difference between division of amplitude and division of wave front.	[2]
b)	Describe the properties of Fraunhofer diffraction.	[3]
c)	Write short notes on double refraction.	[2]
d)	Discuss about stimulated emission.	[3]
e)	Explain construction of optical fiber.	[2]
f)	Discuss about attenuation in optical fibers.	[3]
g)	Write salient features of miller indices.	[2]
h)	Calculate packing factor of diamond.	[3]
i)	Write short notes on Burger's vector.	[2]
j)	Write short notes on point defects.	[3]

PART-B

(50 Marks)

2.a)	Explain interference in thin films in transmitted light.	
b)	Give an account of grating experiment.	[5+5]
	OR	
3.a)	Explain Franhofer diffraction due to single slit and extend it to N-slits.	
b)	Discuss in detail about spatial and temporal coherence.	[5+5]
4.a)	Discuss about the characteristics of lasers.	
b)	Describe principle, working and construction of semiconductor lasers.	[5+5]
	OR	
5.a)	Give an account of absorption, spontaneous and stimulated emission.	
b)	Explain principle and working nicol prism.	
c)	Write any four applications of lasers.	[10]
6.a)	Explain the use of fiber optic cables in communication system.	
b)	Obtain an expression for numerical aperture.	
c)	Write any four applications of fiber optics in medicine.	[10]
	OR	
7.a)	Discuss about construction and principle of optical fiber with the help of neat diagrams.	
b)	Write in detail about step index and graded index fibers.	[5+5]

8.a) Define atomic radius, coordination number and packing fraction.
b) Explain classification of crystals based on the lattice parameters.
c) Write short notes on Miller indices. [10]

OR

9.a) Prove that FCC is closely packed when compared to bcc and sc.
b) Write short notes on HCP and crystal planes and directions. [5+5]

10.a) Discuss about line defects and also explain the significance of Burger's vector.
b) Discuss about determination of crystal structure by Laue method. [5+5]

OR

11.a) Give an account of vacancies, substitutional, interstitial defects.
b) Estimate concentration of Frenkel defects at a given temperature. [5+5]

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Code No: 121AD

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May - 2018
ENGINEERING PHYSICS
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, AME, MIE, PTM, CEE, MSNT)

Time: 3 hours **Max Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

1.a) Define Coordination number and Packing factor. [2]
b) Sketch the (100), (110) and (111) planes in a simple Cubic structure. [3]
c) Define Fermi Energy. [2]
d) State the Bloch theorem. [3]
e) Define the Dielectric constant of a material. [2]
f) Explain the nature of superconductor in the magnetic field. [3]
g) What is diffraction grating? [2]
h) An optical fiber having refractive indices of 1.6 and 1.59 for core and cladding respectively is placed in water of refractive index 1.33. Find the Numerical Aperture of the fiber. [3]
i) Write is the significance of Surface to Volume ratio in nanomaterials. [2]
j) A hall with volume 6000 m^3 has reverberation time 1.2 sec. Find the total absorption in the hall. [3]

PART-B

(50 Marks)

2.a) Distinguish between Ionic, Covalent and Metallic bonds in solids.
b) Obtain the expression for the inter planar spacing of the orthogonal crystal system. [5+5]

OR

3.a) Describe the crystal structure of diamond.
b) State the Bragg's law of X-ray diffraction. Discuss the Laue method of X-ray diffraction for the determination of crystal structure. [4+6]

4.a) What are Matter waves? How they are different from electromagnetic waves.
b) Formulate Schroedinger's Time Independent wave equations for a particle in one dimensional infinite square well potential and obtain the expression for its energy values. [3+7]

OR

5.a) Distinguish between Maxwell – Boltzmann, Bose Einstein and Fermi – Dirac distributions.

b) Draw E-K curves for an electron in periodic potential and explain how it leads to formation of energy bands in solids. [6+4]

6.a) What is density of polarization? Obtain a relation between polarization density and electric displacement vector.

b) Define electronic polarization. Derive an expression for electronic polarizability. [3+7]

OR

7.a) Distinguish between dia, para, ferro, antiferro and ferri magnetic materials.

b) Write two applications of ferrimagnetic materials.

c) What are type I and type II super conductors. [5+2+3]

8.a) Explain the phenomenon of interference in reflected light from a thin film. Obtain the condition for maxima and minima.

b) How this phenomenon is used to reduce the heating effect of sun light from the roof of a building. [8+2]

OR

9.a) Write down the characteristics of Laser light.

b) Describe the construction and working of He-Ne laser with suitable diagrams. [2+8]

10.a) What are direct and indirect band gap semiconductors?

b) State and explain the Hall-effect and derive the expression for Hall coefficient.

c) The Hall coefficient of specimen is 3.66×10^{-4} m^3/coul. Find the number of charge carriers present per unit volume of the specimen. [3+5+2]

OR

11.a) Derive an expression for the concentration of electrons in an intrinsic semiconductor.

b) Describe the Sol-Gel method of preparation of Nanomaterials. [5+5]

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Code No: 111AD

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May - 2018
ENGINEERING PHYSICS
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, MCT, ETM, MMT, AE, AME, MIE, PTM, CEE, MSNT, AGE)

Time: 3 hours **Max Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

1.a) Define Coordination number and Packing factor. [2]
b) Sketch the (100), (110) and (111) planes in a simple Cubic structure. [3]
c) Define Fermi Energy. [2]
d) State the Bloch theorem. [3]
e) Define the Dielectric constant of a material. [2]
f) Explain the nature of superconductor in the magnetic field. [3]
g) What is diffraction grating? [2]
h) An optical fiber having refractive indices of 1.6 and 1.59 for core and cladding respectively is placed in water of refractive index 1.33. Find the Numerical Aperture of the fiber. [3]
i) Write is the significance of Surface to Volume ratio in nanomaterials. [2]
j) A hall with volume 6000 m^3 has reverberation time 1.2 sec. Find the total absorption in the hall. [3]

PART-B

(50 Marks)

2.a) Distinguish between Ionic, Covalent and Metallic bonds in solids.
b) Obtain the expression for the inter planar spacing of the orthogonal crystal system. [5+5]

OR

3.a) Describe the crystal structure of diamond.
b) State the Bragg's law of X-ray diffraction. Discuss the Laue method of X-ray diffraction for the determination of crystal structure. [4+6]

4.a) What are Matter waves? How they are different from electromagnetic waves.
b) Formulate Schroedinger's Time Independent wave equations for a particle in one dimensional infinite square well potential and obtain the expression for its energy values. [3+7]

OR

5.a) Distinguish between Maxwell – Boltzmann, Bose Einstein and Fermi – Dirac distributions.

b) Draw E-K curves for an electron in periodic potential and explain how it leads to formation of energy bands in solids. [6+4]

6.a) What is density of polarization? Obtain a relation between polarization density and electric displacement vector.

b) Define electronic polarization. Derive an expression for electronic polarizability. [3+7]

OR

7.a) Distinguish between dia, para, ferro, antiferro and ferri magnetic materials.

b) Write two applications of ferrimagnetic materials.

c) What are type I and type II super conductors. [5+2+3]

8.a) Explain the phenomenon of interference in reflected light from a thin film. Obtain the condition for maxima and minima.

b) How this phenomenon is used to reduce the heating effect of sun light from the roof of a building. [8+2]

OR

9.a) Write down the characteristics of Laser light.

b) Describe the construction and working of He-Ne laser with suitable diagrams. [2+8]

10.a) What are direct and indirect band gap semiconductors?

b) State and explain the Hall-effect and derive the expression for Hall coefficient.

c) The Hall coefficient of specimen is 3.66×10^{-4} m^3/coul. Find the number of charge carriers present per unit volume of the specimen. [3+5+2]

OR

11.a) Derive an expression for the concentration of electrons in an intrinsic semiconductor.

b) Describe the Sol-Gel method of preparation of Nanomaterials. [5+5]

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Code No: 51002 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May - 2018
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, ETM, MMT, AE, BT, AME, MIE, PTM, MSNT, AGE)

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

Answer any five questions
All questions carry equal marks

1.a) Test the following series for convergence
$\frac{1}{2}+\frac{1.3}{2.4}.\frac{1}{2}+\frac{1.3.5}{2.4.6}.\frac{1}{3}+\ldots\ldots\ldots to\ \infty.$

b) Prove that the series $\sum 2^n \sin\left(\frac{x}{3^n}\right)$ converges absolutely for all values of x. [7+8]

2.a) Use Lagrange's mean value theorem, prove that $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$ and deduce that $\frac{\pi}{4}+\frac{3}{25} < \tan^{-1}\frac{4}{3} < \frac{\pi}{4}+\frac{1}{6}$.

b) If $x = uv$ and $y = \frac{u+v}{u-v}$, find $\frac{\partial(u,v)}{\partial(x,y)}$. [8+7]

3.a) Trace the curve $y^2(a-x) = x^2(a+x)$.

b) Find the co-ordinates of the centre of the curvature at any point of the parabola $y^2 = 4ax$, and hence find its evolute. [7+8]

4.a) Evaluate $\iint y\,dx\,dy$ over the region R, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\,dz\,dy\,dx$. [7+8]

5.a) Solve the differential equation $y(xy+e^x)dx - e^x dy = 0$.

b) Show that the system of confocal conics $\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1$, where λ is a parameter, is self orthogonal. [7+8]

6.a) Solve $(D^2-2D+1)y = x^2e^{3x} - \sin 2x + 3$.

b) In an $L-C-R$ circuit, the charge 'q' on a plate of condenser is given by $L\frac{d^2q}{dt^2}+R\frac{dq}{dt}+\frac{q}{C} = E\sin\omega t$. The circuit is tuned to resonance so that $\omega^2 = \frac{1}{LC}$. If initially the current i and the charge q be zero, show that, for small values of R/L, the current at time t is given by $(Et/2L)\sin\omega t$. [7+8]

7.a) Evaluate $L\{te^{2t}\sin 2t\}$.

b) Solve the differential equation $\frac{d^2x}{dt^2}+4\frac{dx}{dt}+8x=e^{2t}$, given $x(0)=2$ and $x'(0)=2$ using Laplace transforms. [7+8]

8.a) Find the constants a, b and c if the vector $\bar{f}=(2x+3y+az)\bar{i}+(bx+2y+3z)\bar{j}+(2x+cy+3z)\bar{k}$ is irrotational.

b) Apply Green's theorem to evaluate $\oint_C (2x^2-y^2)dx+(x^2+y^2)dy$, where C is the boundary of the area enclosed by the x-axis and upper half of the circle $x^2+y^2=a^2$. [7+8]

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