

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) Solve $y = a \sqrt{1 + p^2}$. [2]
- b) Solve $\frac{1}{p^2} x^4$. [2]
- c) Evaluate $\int_{x=1}^3 \int_{y=0}^1 xy^2 dy dx$. [2]
- d) If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then evaluate $\nabla^2(r^2)$. [2]
- e) Find the value of $\int_V (\vec{i} + \vec{j} + \vec{k}) dV$. [2]
- f) Find the integrating factor of $\frac{dy}{dx} + 2xy = e^{-x^2}$. [3]
- g) Solve $(D^3 - 4D^2)y = 5$. [3]
- h) Find the limits after changing the order of integration for $\int_0^b \int_0^{a/b\sqrt{b^2-y^2}} f(xy) dy dx$. [3]
- i) Find a unit vector normal to the surface $x^3 + y^3 + 3xyz = 3$. [3]
- j) If $\vec{F}(t) = x\vec{i} + 2y\vec{j} + z\vec{k}$ then evaluate $\int_1^2 \text{curl } \vec{F}(t) dt$. [3]

PART-B

(50 Marks)

- 2.a) Solve $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2, y(0) = 0$.
 - b) If 30% of a radioactive substance disappears in 10 days, how long will it take for 90% of it to disappear? [5+5]
- OR
- 3.a) Solve $(y + y^2)dx + xy dy = 0$.
 - b) Solve $(x + 2y^3) \frac{dy}{dx} = y$. [5+5]
- 4.a) Solve $(D^2 + 4)y = \tan 2x$ by variation of parameters.
 - b) Solve $(D^3 + 4D)y = 5 + \sin 2x$. [5+5]
- OR
- 5.a) Solve $(D^2 + 4D + 3)y = e^{e^x}$.
 - b) Solve $(D^2 + 1)y = x^2 \sin 2x$. [5+5]

- 6.a) Evaluate $\int_0^\pi \int_0^{a(1+\cos\theta)} r^2 \cos\theta \, dr \, d\theta$.
 b) Evaluate $\int_0^{\log 2} \int_0^x \int_0^{x+\log y} e^{x+y+z} \, dz \, dy \, dx$.

[5+5]

OR

- 7.a) Change into polar co-ordinates and evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} \, dy \, dx$.
 b) Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$.

[5+5]

- 8.a) Find the angle between the normal to the surface $xy = z^2$ at the points $(4, 1, 2)$ and $(3, 3, -3)$.
 b) Prove that $\nabla \cdot (\vec{A} \times \vec{B}) = \vec{B} \cdot (\nabla \times \vec{A}) - \vec{A} \cdot (\nabla \times \vec{B})$.

[5+5]

OR

- 9.a) Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 39$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z + 52 = 0$ at the point $(4, -3, 2)$.
 b) A vector field is given by $\vec{A} = (x^2 + xy^2)\vec{i} + (y^2 + x^2y)\vec{j}$. Show that the field is irrotational and find the scalar potential.

[5+5]

10. Find the work done in moving a particle in the force field $\vec{F} = 3x^2\vec{i} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from $(0, 0, 0)$ to $(2, 1, 3)$.

[10]

OR

- 11.a) Evaluate $\iint_S \vec{F} \cdot \hat{n} \, ds$ if $\vec{F} = 2xy\vec{i} + yz^2\vec{j} + xz\vec{k}$ over the parallelepiped $x = 0, y = 0, z = 0, x = 2, y = 1, z = 3$.
 b) If $\vec{F} = (3x^2 - 2z)\vec{i} - 4xy\vec{j} - 5x\vec{k}$, Evaluate $\int_V \text{curl } \vec{F} \, dv$, where V is volume bounded by planes $x = 0, y = 0, z = 0$ and $3x + 2y - 3z = 6$.

[5+5]

---ooOoo---

R16**Code No: 132AA****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech I Year II Semester Examinations, May - 2019****ENGINEERING PHYSICS – II****(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 dual nature of light.
- b) Define de-Broglie's hypothesis.
- c) Define Fermi energy level at 0K.
- d) Draw V-I Characteristic curve of PN junction diode.
- e) Define Polarization vector.
- f) Explain pyro electricity.
- g) Define magnetic susceptibility.
- h) Distinguish between soft and hard magnetic materials.
- i) What is nano size? Explain briefly.
- j) Write any two applications of nanomaterials.

[2]
[3]
[2]
[3]
[2]
[3]
[2]
[3]
[2]
[3]

PART-B**(50 Marks)**

- 2.a) With neat diagram explain Davisson and Germer's experiment.
 - b) Describe formation of energy bands in solids.
- OR**
- 3.a) Derive Schrödinger's time independent wave equation.
 - b) Explain physical significance of wave function (ψ).
- 4.a) Distinguish between direct and indirect band gap semiconductors.
 - b) Determine the concentration of the charge carriers in conduction band of intrinsic semiconductors.
- OR**
- 5.a) Explain formation of PN junction diode.
 - b) Describe construction and working principle of Solar Cell.
- 6.a) Derive an expression for Clausius-Mosotti relation.
 - b) Describe Ferro electricity of a dielectric material.
- OR**
- 7.a) Derive an expression for electronic polarizability.
 - b) Discuss Piezo electricity of a dielectric material.

[5+5]
[5+5]
[4+6]
[4+6]
[5+5]
[5+5]

8.a) Discuss classification of magnetic materials.

b) Explain hysteresis curve based on domain theory of ferro magnetism.

[5+5]

OR

9.a) What is Meissner's effect? Write any two applications of superconductors.

b) Derive an expression for Bohr magneton.

[5+5]

10.a) Explain how surface to volume ratio varies in nano materials.

b) Describe preparation of nanomaterials by using Sol-Gel method.

[4+6]

OR

11.a) Explain Quantum confinement.

b) Explain how the nanomaterials are characterized by using SEM and TEM.

[4+6]

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R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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ENGINEERING CHEMISTRY

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Time: 3 hours

Max. Marks: 75

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PART- A

(25 Marks)

- 1.a) What are the permanent hardness causing substances? [2]
- b) How Caustic embrittlement can be prevented? [3]
- c) Differentiate Primary and Secondary battery. [2]
- d) Write anode and cathode reactions of MeOH oxygen cell. [3]
- e) Differentiate plastic and resin. [2]
- f) Why natural rubber should be vulcanized? [3]
- g) What do you understand by cracking? [2]
- h) What is the significance of proximate analysis? [3]
- i) How composites are classified? Give examples. [2]
- j) List characteristics of good refractory material. [3]

PART-B

(50 Marks)

- 2.a) Write in detail an account on Scale and Sludge formation in boilers.
- b) One litre of water from an underground reservoir in Tirupathi Town in Andhra Pradesh showed the following analysis for its contents:
 $\text{Mg}(\text{HCO}_3)_2 = 42\text{mg}$; $\text{Ca}(\text{HCO}_3)_2 = 146\text{mg}$; $\text{CaCl}_2 = 71\text{mg}$; $\text{NaOH} = 40\text{mg}$; $\text{MgSO}_4 = 48\text{mg}$; organic impurities = 100mg; Calculate temporary, permanent and total hardness of this sample of water in degree French and Clark. [5+5]

OR

- 3.a) Why is Ion exchange process preferred for the softening of water for use in boilers?
- b) Write a note on disinfection of water. [5+5]
- 4.a) How pH of a solution is determined by Glass electrode? Discuss.
- b) Describe the charging and discharging process of Lithium ion cell. [5+5]

OR

- 5.a) Give a brief account on concentration cell.
- b) Describe a Lead acid battery with cell reactions. [5+5]

6.a) Give preparation, properties and applications of Nylon and Buna-s-rubber.

b) Describe the compression moulding process.

[5+5]

OR

7.a) Describe the preparation, properties and applications of Polylactic acid and poly vinyl alcohol.

b) Differentiate between thermoplastic polymers and thermosetting polymers.

[5+5]

8.a) Give an account on moving bed catalytic cracking.

b) Illustrate composition and uses of Natural gas and LPG.

[5+5]

OR

9.a) Explain the analysis of coal by ultimate analysis.

b) A coal sample having the following composition.

C=88%, O=5% S=0.5%, N=0.5% and ash=2.5%.

The net calorific value was found to be 500.5kcal/kg. Calculate percentage of hydrogen and high calorific value of the fuel.

[5+5]

10.a) Describe any one mechanism of lubrication.

b) Write the chemical reactions involved in setting and hardening of cement.

[5+5]

OR

11.a) What do you understand by refractoriness under load? Explain.

b) Explain Viscosity of lubricants and its determination.

[5+5]