

Code No: 152AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, August - 2019

MATHEMATICS-II

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM)

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) State the Newton's law of cooling. [2]
- b) Solve The D.E $(D^2 + 2D + 1)y = 0$. [2]
- c) Evaluate $\int_0^2 \int_0^1 xy dy dx$. [2]
- d) Find $\nabla \cdot \vec{r}$ [2]
- e) State stoke's theorem. [2]
- f) Find the integral factor of the differential equation of $\frac{dy}{dx} - y \sin 2x = \cot x$. [3]
- g) Find the P.I of $(D^2 + 5D + 6)y = 1 + 2x + x^2$. [3]
- h) Evaluate $\int_{\theta=0}^{\pi} \int_{r=0}^{a \cos \theta} r dr d\theta$ [3]
- i) If $\vec{f} = x^2 y \vec{i} - 2xz \vec{j} + 2yz \vec{k}$ then find $\text{Curl } \vec{f}$ [3]
- j) Find the work done in moving a particle in the force field $\vec{F} = xi - j + k$ along the straight line from (0,0,0) to (2,1,3). [3]

PART-B**(50 Marks)**

- 2.a) Solve the D.E $p^2 + 2xp - 3x^2 = 0$ for p. [5+5]
- b) The temperature of the surrounding air is 20°C . The temperature of a hot body reduces from 100°C to 70°C in 1 hr. Find the temperature of the body after 2 hrs. [5+5]

OR

- 3.a) Solve the D.E $xp^2 - 2yp + x = 0$ for y. [5+5]
- b) Solve the differential equation $(x^2 + 2 \sin y) dx + (2x \cos y + y) dy$. [5+5]
- 4.a) Solve the D.E $(D^2 - 2D + 2)y = \sin x + e^{-2x}$. [5+5]
- b) Solve the D.E $(x+a)^2 y'' - 4(x+a)y' + 6y = x$. [5+5]

OR

- 5.a) Solve the D.E $(D^2 - 4)y = \cosh(2x-1) + e^{2x}$. [5+5]
- b) Solve the D.E $x^2 y'' - xy' + 4y = x^2 \sin(\log x)$. [5+5]

6.a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2 + y^2) dx dy$ by changing in to polar co-ordinates.

b) Find the volume of ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ [5+5]

OR

7.a) By change of order of integration evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dy dx$

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx dy dz}{\sqrt{1-x^2-y^2-z^2}}$ [5+5]

8.a) Find the directional derivative of $\phi = xyz$ at $(1, -1, 1)$ along the direction which makes equal angles with the positive direction of x, y, z axes.

b) Prove that $\nabla^2(r^n) = n(n+1)r^{n-2}$ [5+5]

OR

9.a) Find the constants 'a' and 'b' such that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$ cuts orthogonally at $(1, -1, 2)$.

b) Prove that $\vec{F} = 2xy \sin z \vec{i} + x^2 \sin z \vec{j} + x^2 y \cos z \vec{k}$ is irrotational and find its scalar potential. [5+5]

10.a) Evaluate $\iiint_V f(x, y, z) dx dy dz$ where $\vec{f} = 3\vec{i} - \vec{j} - 2\vec{k}$ bounded by the volume (v) by the planes $x=0, y=0, z=0$ and $2x + 2y + z = 4$.

b) Evaluate $\iint_S x^3 dy dz + x^2 y dx dz + x^2 z dx dy$ over the surface bounded by the planes $z=0, z=b$ and the cylinder $x^2 + y^2 = a^2$ using Gauss divergence theorem [5+5]

OR

11.a) Find the flux of vector function $\vec{F} = (x - 2z)\vec{i} + (x + 3y)\vec{j} + (5x + y)\vec{k}$ through the upper side of the triangle ABC with vertices $(1, 0, 0), (0, 1, 0), (0, 0, 1)$.

b) Prove that $\oint_C (f \nabla g) \cdot d\vec{r} = \int_S (\nabla f \times \nabla g) \cdot \vec{n} ds$ using stoke's theorem. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, August - 2019

ENGINEERING CHEMISTRY

(Common to CE, ME, MCT, MMT, AE, 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) How exhausted ion-exchange resins are regenerated? Give chemical reactions. [2]
- b) Define hardness of water and what are the units used for expressing hardness of water and give their interrelation? [3]
- c) What is electrode potential? [2]
- d) Derive Nernst equation. [3]
- e) What are biodegradable polymers? Give examples. [2]
- f) What are fiber reinforced plastics? Explain its advantages. [3]
- g) What are the characteristics of good fuel? [2]
- h) Define Knocking, Octane number and cetane number. [3]
- i) What are extreme pressure lubricants? Give examples. [2]
- j) What is water proof cement? Write examples. [3]

PART-B**(50 Marks)**

- 2.a) How to determine fluoride ion by ion-selective electrode method?
- b) What are the disadvantages of scales and sludges and explain their prevention methods? [5+5]

OR

- 3.a) Describe the Reverse Osmosis process for softening of hard water.
- b) Discuss the active sludge process of sewage water treatment. [5+5]
- 4.a) What is electrochemical series? Write the applications of electrochemical series.
- b) Define fuel cell? Explain construction and working of Hydrogen-Oxygen fuel cell. [5+5]

OR

- 5.a) Describe the construction and working of standard calomel electrode.
- b) What is Concentration cell? Explain with example. [5+5]

- 6.a) What is compounding of plastics? What are the different constituents of compounding, write their uses.
- b) What are conducting polymers? Explain the conduction mechanism in trans-polyacetylene. [5+5]

OR

- 7.a) Define polymerization and explain the characteristics of condensation polymerization.
- b) What are the advantages of biodegradable polymers? Write the uses of polylactic acid and PVA. [5+5]

- 8.a) What is coal? How is it analysed by proximate analysis method?
b) What is petrol? How is it synthesized by Fischer-Tropch's process? [5+5]

OR

- 9.a) Calculate the gross and net Calorific value of coal sample having the following composition. C=90%, H=1%, O=3%, N=5% and ash=1%.
b) Differentiate between thermal and catalytic cracking. [5+5]

- 10.a) What are lubricants? Give their classification with suitable examples.
b) Discuss the various steps involved in setting and hardening of cement with chemical equations. [5+5]

OR

- 11.a) What are refractories? How they are classified? Give essential requirements of good refractory materials?
b) What are composite materials? Explain its classification and applications. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, August - 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) Draw a E-K curve. [2]
- b) What are matter waves? Explain their properties. [3]
- c) Explain about the formation of PN junction. [2]
- d) Explain the effect of temperature and dopants on the Fermi level in a n- type semiconductors. [3]
- e) Give the differences between dielectric materials and insulating materials. [2]
- f) Deduce Clausius- Mossotti relation. [3]
- g) Explain the effect of magnetic field on a superconductor. [2]
- h) What should be the characteristics of permanent magnetic materials? [3]
- i) Define top-down and bottom-up approach for synthesis of nanomaterials. [2]
- j) What is Nanotechnology? How is it useful to society? [3]

PART-B

(50 Marks)

- 2.a) Derive time independent Schrodinger's wave equation.
- b) An electron is bound in a one dimensional box of width 0.4nm. What is its minimum energy? [8+2]

OR

- 3.a) Explain the origin of formation of energy bands in solids.
- b) State Heisenberg uncertainty principle. Calculate the uncertainty in measurement of momentum of an electron if an uncertainty in locating it is 1 \AA . [6+4]

4. Derive an expression for the density of holes in the valence band of p-type semiconductor. [10]

OR

5. Explain the construction and working principle of Solar cell and discuss any two applications of solar cell. [10]

- 6.a) What are the ferro-electric substances? Give the theory of ferro-electricity and mention their applications.

- b) Derive an expression for ionic polarizability of an ionic solid. [5+5]

OR

- 7.a) Explain the Electronic polarization in atom and obtain an expression for electronic polarizability in terms of the radius of the atom.

- b) The radius of a gaseous atom is 0.062 nm. Calculate the polarizability of the gas and its relative permittivity. Given that the number of atoms of the gas is 2.7×10^{25} per m^3 . [8+2]

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8.a) Describe with examples the different types of magnetic materials.

b) Write a short note on Bohr magneton.

[8+2]

OR

9.a) Explain the principle of formation of domains in a ferromagnetic materials.

b) Explain the hysteresis loop observed in ferromagnetic material.

[4+6]

10.a) What are the general properties of the nanomaterials.

b) Explain qualitatively why they are significantly different compared with those of the bulk materials of the same composition.

c) Explain Ball milling method.

[3+3+4]

OR

11.a) Describe the CVD technique for synthesis of nano materials.

b) What are the advantages and applications of nano materials?

[6+4]

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