

B. Sc (Non Medical) 6th Semester
Real and Complex Analysis – 09010601
END TERM THEORY EXAMINATION

Time: 03:00 Hrs

Max. Marks: 40

Instructions:

1. Write Roll No. on the Question Paper.
2. Candidate should ensure that they have been provided with correct question paper. Complaint(s) in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint in this regard will be entertained thereafter.
3. Attempt 5 Questions in all. Q. No. 1 is compulsory. Students are required to attempt other FOUR questions selecting atleast one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

Q.1. Answer the following Questions. (4*2=8)

- a) Obtain a fourier series for the function $f(x) = x$ in the interval $(-\pi, \pi)$
- b) Determine the of angle of rotation for the transformation $w = z^2$ at the point $1-i$.
- c) Show that the function $f(z) = \sin z$ is an analytic function.
- d) Find the bilinear transformation with fixed points as $\{1, 0, i, -i\}$

UNIT-I

Q.2. (a) If $f(x) = \left(\frac{\pi-x}{2}\right)^2$ in the interval $0 < x < 2\pi$, show that $f(x) = \frac{\pi^2}{12} + \sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$, and hence obtain the relation $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$ (5)

(b) Obtain the half range cosine series for the function $f(x) = x^2$ in the range $0 \leq x \leq \pi$ (3)

OR

Q.3. (a) Expand $f(x) = x \sin x$ as a fourier series in the interval $[0, 2\pi]$ (4)
 (b) Obtain Fourier series for the function $f(x)$ given by (4)

$$f(x) = \begin{cases} x, & -\pi < x < 0 \\ \pi - x, & 0 < x < \pi \end{cases}$$

UNIT-II

Q.4. (a) Determine the analytic function whose real part is $e^{2x}(x \cos 2y - y - \sin 2y)$. (4)

(b) Show that the function $f(z) = \sqrt{xy}$, where $z = x + iy$ is not analytic at the origin even though C-R equations are satisfied there. (4)

OR

Q.5. (a) Show that the polar form of Cauchy-Riemann equation are: (5)

$$\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \quad \frac{\partial u}{\partial \theta} = -r \frac{\partial v}{\partial r}$$

(b) If $f(z) = \begin{cases} \frac{x^3 y(y-ix)}{x^6 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$, then prove that $\frac{f(z)-f(0)}{z} \rightarrow 0$ as $z \rightarrow 0$

along any radius vector. (3)

✓

UNIT-III

Q.6. (a) What is the region of the w -plane into which the rectangular region in the z -plane bounded by the lines $x=0$, $x=1$, $y=0$ and $y=2$ is mapped under the transformation $w = z + (2-i)$ (4)

(b) What are Mobius transformations. Show that every Mobius transformation is composed as a sequence of simple transformations. (4)

OR

Q.7. (a) Find the image of rectangular region $a \leq x \leq b$, $c \leq y \leq d$ under the map $w = e^z$ (4)

(b) Let $w = \frac{i(1-z)}{1+z}$. Then show that if $\text{Im } z < 1$, then $\text{Im } w > 0$ (4)

*****ETE MAY JUNE 2018*****

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B. Sc (Non Medical) 6th SEMESTER
LINEAR ALGEBRA - 9010602
END TERM THEORY EXAMINATION

Time: 03:00 Hrs

Max. Marks: 40

Instructions:

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3. Attempt 5 Questions in all. Q. No. 1 is compulsory. Students are required to attempt other FOUR questions selecting atleast one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

- Q1.** a) Show that if two vectors are linearly dependent, then one of them is scalar multiple of the other.
 b) Find the co-ordinates of vector $(1,1,1)$ relative to basis $(1,1,2)$, $(2,2,1)$, $(1, 2,2)$.
 c) Let V be an inner product space. Then show that $\|u + v\| \leq \|u\| + \|v\|$.
 d) Show that the map $T : R^3 \rightarrow R^3$ defined by $T(x, y, z) = (|x|, y - z)$ is not a linear transformation.

(4X2=8)

UNIT-I

- Q2.** a) Determine a basis of the sub-space spanned by the vectors $(-3,1,2)$, $(0,1,3)$, $(2,1,0)$, $(1,1,1)$. (4)
 b) Show that the intersection of two subspaces W_1 and W_2 of a vector space $V(F)$ is also a subspace of $V(F)$. (4)
- Q3.** a) If $V(F)$ is a finitely generated vector space, then show that any maximal linearly independent subset of V is a basis of V . (4)
 b) Let W be a subspace of a finite dimensional vector space $V(F)$, then show that

$$\dim \frac{V}{W} = \dim V - \dim W$$
 (4)

UNIT-II

- Q4.** a) Find the Eigen values and the corresponding eigen space for the matrix (4)

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

- b) If $T : U(F) \rightarrow V(F)$ IS A Linear transformation, then show that Rank T + Nullity T = $\dim U$ (4)

Q5. a) Define Kernel of a Linear transformation. Let $T:U \rightarrow V$ be a linear transformation then show T is one- to- one iff $N(T) = \{0\}$ (4)

b) If T is a linear operator on $R^3(R)$ which is represented in the standard ordered by the matrix (4)

$$\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix} \text{ show that } T \text{ is diagonalizable.}$$

UNIT-III

Q6. a) Let $V(F)$ be an inner product space. If $\alpha, \beta \in V$ such that $|\langle \alpha, \beta \rangle| = \|\alpha\| \cdot \|\beta\|$, then show that α and β are linearly dependent. (4)

b) Show that every finite dimensional vector space is an inner product space. (4)

Q7. a) Let W be a subspace of $R^4(R)$ generated by the vectors $u_1 = (1, 2, 3, -2)$ and $u_2 = (2, 4, 5, -1)$. Obtain a basis for W^\perp . (4)

b) Show that every finite dimensional inner product space has an orthonormal basis. (4)

Roll No.

B.S.C. (NON-MEDICAL) – 6TH SEMESTER
NUMERICAL ANALYSIS – 09010603
END TERM THEORY EXAMINATION

Time: 03.00 Hrs.

Max. Marks: 40

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1. Write your Roll no on the Question paper.
2. Candidate should ensure that they have been provided with the correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt any Five (05) Questions. Q.1. is compulsory. Students are required to attempt other four (04) question selecting atleast one (01) from each Unit. Marks are indicated against each question.
4. Draw diagram wherever required.

1. Answer the following questions:

[1 × 2 = 8]

- a. Define the following operators: (i) Δ (ii) ∇ (iii) E (Shift operator) (iv) Averaging operator μ .
- b. What is Binomial distribution ? Write the probability density function of Normal distribution.
- c. Write Trapezoidal and Simpson's 1/3 formula for numerical integration.
- d. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$, find y for $x = .02$ by using Euler method with step length $h = .02$.

Unit 1

- 2a. Use Newton's formula to find the cubic polynomial which takes the following values. Also find $f(4)$. [4]

x	0	1	2	3
f(x)	1	2	1	10

- 2b. Find the missing term in the following table [4]

x	2	3	4	5	6
y=f(x)	45.0	49.2	54.1	...	67.4

- 3a. Use stirling formula in the following data to estimate the value of $\tan 16^\circ$. [4]

θ	0	5	10	15	20	25	30
$\tan \theta$	0	.0875	.1763	.2679	.3640	.4663	0.5774

3b. Fit a Poisson distribution to the following data: [4]

x	0	1	2	3	4
y=f(x)	123	59	14	3	1

Unit 2

4a. Use Jacobi's method to find all the eigen values and the eigen vectors of the matrix. [4]

$$\begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}$$

4b. Find the first derivative of $y = f(x)$ at $x = 1.1$, where [4]

x	1	1.2	1.4	1.6	1.8	2
y=f(x)	0	.128	.544	1.296	2.432	4

5a. The following is the frequency distribution of 128 throws of seven coins, according to number of heads. Fit a Binomial distribution. Also find the mean and standard deviation of the distribution. [4]

x	0	1	2	3	4	5	6	7	Total
y=f(x)	7	6	19	35	30	23	7	1	128

5b. Using power method, find the largest eigen value and the corresponding eigen vector of the matrix [4]

$$\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

Unit 3

6a. Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using (i) Trapezoidal rule, (ii) Simpson's 1/3 rule. [4]

6b. Apply Runge-Kutta fourth order method to find an approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ at $x = 0$. [4]

7a. Apply modified Euler method to find an approximate value of y when $x = 0.2$ and $h = .1$. It is given that $\frac{dy}{dx} = -xy^2$ and $y = 2$ at $x = 0$. [4]

7b. Use Milne's- Simpson's method to obtain the solution of the equation $\frac{dy}{dx} = x - y^2$ at $x = 0.8$ given that $y(0) = 0, y(.2) = .02, y(.4) = .0795, y(.6) = 0.1762$. [4]

B. Sc (NM) 6th Semester
Atomic, Molecular & Laser Physics - 9010604
END TERM THEORY EXAMINATION

Time: 03:00 Hrs

Max. Marks: 40

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3. Attempt 5 questions in all. Q. No. 1 is compulsory. Students are required to attempt other **FOUR** questions selecting **AT LEAST** one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

Q.1. Answer any **FOUR** questions. (2x4=8)

- (a) Find the energy in eV of 2nd shell of H-like He-atom (He atom where there is only one electron left).
- (b) What is the minimum energy (in eV) needed to remove the electron in ground state of He⁺ ion?
- (c) If we have to excite vibrational states in molecules, which electromagnetic energy band would be appropriate?
- (d) Tell us the principle of operation of heating food using microwave oven.
- (e) Explain coherence of light with example.
- (f) Does electron in *1s* quantum state of H-atom move in a circular orbit? Please explain if circular orbit is justified quantum mechanically.

UNIT-I

Q.2. (a) Explain two types of angular momenta in atom.
 (b) Describe vector model of atomic angular momenta. (4+4=8)

Q.3. (a) Mention two reasons for deviation of electronic energy from H-like formula.
 (b) Explain splitting of D1-D2 lines in Na. (4+4=8)

UNIT-II

Q.4. (a) Explain Zeeman effect with an example.
 (b) How is Zeeman effect different from spin-orbit coupling? Give example of spin-orbit coupling. (4+4=8)

Q.5. (a) Explain Stark effect in atom.
 (b) If H-atom is present in plasma environment, we may observe broad lines in atomic emission spectra instead of sharp lines which we normally get. Explain the main cause of broadening. (4+4=8)

UNIT-III

Q.6. (a) Explain main properties of LASER. (4+4=8)
 (b) Explain the principles of lasing action.

Q.7. (a) Explain Raman effect and Stokes and anti-Stokes lines (4+4=8)
 (b) Give the major components of a Raman spectrometer and give some functions of each.

Roll No. _____

B. Sc (Non-Medical) – 6th SEMESTER
NUCLEAR PHYSICS - 09010605
END TERM THEORY EXAMINATION

Time: 03:00 Hrs

Max. Marks: 40

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3. Attempt 5 Questions in all. Q. No. 1 is compulsory. Students are required to attempt other FOUR questions selecting at least one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

Q.1. Answer the following Questions.

(4 x 2 = 8)

- a) Find the nuclear radius of ${}^{206}_{82}\text{Pb}$ (Take $R_0 = 1.3f$).
- b) What is the difference between odd and even parity?
- c) Define range and straggling.
- d) Define fission and fusion.

UNIT-I

Q.2. Define the terms mass defect and binding energy. Discuss how binding energy per nucleon varies with mass number.

(2+2+4)

- Q.3.** a) What is Moseley's law? Discuss how charge of nucleus is determined by it. **(4)**
b) Discuss the construction and working of Bain-Bridge mass spectrograph. **(4)**

UNIT-II

Q.4. How a heavy charged particle (α particle) interacts with the matter? **(8)**

Q.5. a) What is a neutrino and anti-neutrino? Discuss the β particle spectra. **(4)**

b) Explain the phenomenon of pair production and annihilation of electron – positron pair. **(4)**

UNIT-III

Q.6. Define Q-value of a nuclear reaction. Obtain an expression for it and hence, derive the condition for exoergic and endoergic nuclear reactions **(8)**

Q.7. Discuss the principle, construction and working of a nuclear fission reactor. **(8)**

B. Sc (Non Medical) 6th Semester
Inorganic Chemistry – VI, 09010607
END TERM THEORY EXAMINATION

Time: 00:30 Hrs

Max. Marks: 40

Instructions:

1. Write Roll No. on the Question Paper.
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3. Attempt 5 Questions in all. Q. No. 1 is compulsory. Students are required to attempt other FOUR questions selecting atleast one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

Q1. Attempt any four from the following questions. (4X2=8)

- a) How is electronegativity related to hardness and softness of acid and base?
- b) Define sandwich compounds and haptacity.
- c) What is PHOSPHAM? How is it prepared?
- d) What are essential traces elements?
- e) What is sodium/potassium pump?
- f) Give the IUPAC names $[\text{RhCl}(\text{PPh}_3)_3]$ and $[\text{Fe}(\text{C}_5\text{H}_5)_2]$

UNIT-I

- Q2.** a) Discuss the Pearson's concept of hard and soft acids and bases. Give their characteristics, classifications and applications (6)
- b) Complete the following reaction and explain its validity according to HSAB principle
 reaction $\text{LiI} + \text{CsF} \rightarrow$ (2)
- Q.3** a) Define Phosphazenes. How is cyclic $(\text{PNCl}_2)_3$ prepared? (4)
- b) What are silicones and their classifications? Give few applications of silicones. (4)

UNIT-II

- Q.4** a) What is β elimination in metal alkyls? How can it be avoided? (2)
- b) Give 2 methods of preparation and uses of organo mercury or organo Lithium. (4)
- c) Give few applications of organoaluminium compounds (2)
- Q.5** a) Give two methods of preparation and applications of metal carbonyls. (4)
- b) What is EAN rule? Calculate the EAN of metal in $\text{Cr}(\text{CO})_6$ (2)
- c) Discuss the concept of back bonding in Zeise salt. (2)

UNIT-III

- Q.6** a) What are metalloporphyrins? Give example. (2)
- b) Give a brief account of structure and role of hemoglobin and Myoglobin as oxygen carriers in blood. (4)
- c) What do you understand by Bohr Effect and cooperative effect? (2)
- Q.7.** a) What is nitrogen fixation? How does it take place? Give its importance. (4)
- b) Discuss the toxic effects of mercury and lead in human beings. (2)
- c) Discuss the role of Iodine in our human system. (2)

B.Sc (Non Medical), Semester-VI
Physical Chemistry-VI, 09010608
END TERM THEORY EXAMINATION

Time: 03:00 Hrs

Max. Marks: 40

Instructions:

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3. Attempt five Questions in all. Q. No. 1 is compulsory. Students are required to attempt other FOUR questions selecting at least one from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

- Q1.** Answer the following Questions. (4×2=8)
- (a) What is molecular spectroscopy?
 - (b) Explain Photolysis of acetone?
 - (c) Define ideal and non ideal solutions?
 - (d) What is phase rule?

UNIT-I

- Q2.** (a) What are the different types of energies possessed by a molecule? (4)
(b) What is Born-Oppenheimer approximation? (4)
- Q3.** (a) Explain different types of electronic transitions in organic molecule? (4)
(b) What is Frank – Condon principle? (4)

UNIT-II.

- Q4.** (a) State and explain Lamberts Law? (4)
(b) What is photosensitization? Explain with two examples? (4)
- Q5.** Draw Jablonski diagram? Explain all the radiative and non radiative processes with the help of Jablonski diagram? (8)

UNIT-III

- Q6.** (a) What is elevation in boiling point? Derive the relationship between elevation in boiling point and molecular weight of solute? (4)
(b) State and explain Raoult's Law? (4)
- Q7.** (a) Explain the thermodynamic derivation of Gibbs Phase rule? (4)
(b) Explain the Pb-Ag two component system with the help of phase diagram? (4)

**B.Sc.(Non-Medical) - 6TH SEMESTER
ORGANIC CHEMISTRY - 09010609
END TERM THEORY EXAMINATION**

Time: 03:00 Hrs

Max. Marks: 40

Instructions:

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3. Attempt FIVE (05) questions in all. Q.1 is compulsory and students are required to attempt FOUR (04) questions, selecting atleast one question from each unit. Marks are indicated against each question.
4. Draw diagram wherever required.

Q.1. Answer the following :

- a) Why Pyrrole, Furan and Thiophene are classified as aromatics. (2)
- b) Why Pyridine is more basic than aniline. (2)
- c) Explain why α -hydrogen atoms in propanal are more acidic than hydrogens of propane. (2)
- d) What is isoelectric point? (2)

UNIT -I

- Q.2. a) What are Heterocyclic compounds. Give one method of synthesis of the following : (4)
(i) Furan (ii) Pyridine. (iii) Pyrrole
- b) Discuss the mechanism of Fischer Indole synthesis? (4)
- Q.3. a) Explain why electrophilic substitution in Pyrrole takes place at 2-position, whereas in Pyridine at 3-position? (4)
- b) What is Bischler-Napieralski synthesis of isoquinoline. Describe its mechanism? (4)

UNIT -2

- Q.4. a) How will you prepare ethylacetoacetate in laboratory? What is the reaction known as? Give its mechanism? (4)
- b) Give the method of preparation and uses of following: (4)
(i) Buna-S (ii) Dacron
- Q.5. a) Give two general methods each for the preparation of Sulphonic acids & Sulphaguanidines. (4)
- b) Write a note on synthetic detergents? (4)

UNIT -3

- Q.6. a) Discuss Gabriel Phthalimide synthesis of amino acids? (4)
- b) Discuss the chemistry of Edman's method for N-terminal analysis. (4)
- Q.7. a) Write a note on Solid-phase peptide synthesis. (4)
- b) Write notes on : (4)
(i) Dipolar nature of amino acids. Give evidences.
(ii) Electrophoresis. (4)

B.Sc.(Non-Medical) – 6th SEMESTER EXAMINATION; DECEMBER - 2017
(SUB:- ORGANIC CHEMISTRY-VI; PAPER CODE:-09010609)

TIME: 03:00 Hrs.

Max Marks:40

Instructions:-

1. Write your Roll No. on the Question Paper.
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3. Attempt five (05) questions in all, Q1. is compulsory. Students are required to attempt four (04) questions, selecting at least one (01) question from each unit. Marks are indicated against each question.
4. Draw the diagram wherever required.

- Q.1.** a) Describe molecular orbital of pyridine. (2)
 b) Explain pyridine is more basic than pyrrole. (2)
 c) Explain desulphurization of thiols with Raney Nickel. (2)
 d) Explain dipolar ions behavior of amino acids. (2)

UNIT-I

- Q.2.** a) Write a note on electrophilic substitution in pyridine. (4)
 b) Write one method of synthesis of quinoline. (4)
- Q.3.** a) Write all steps of Fischer indole synthesis. (4)
 b) Write mechanism of electrophilic substitution of isoquinoline. (4)

UNIT-II

- Q.4.** a) Explain the reaction mechanism of production of high density polyethylene. (4)
 b) Write one method of preparation of sulphamide and desulphurization of benzene sulphonic acid. (4)
- Q.5.** a) Write structure of Novolac and Resole and explain the difference between the two. (4)
 b) Explain Claisen condensation reaction mechanism and keto-enol tautomerization of ethylacetoacetate. (4)

UNIT-III

- Q.6.** a) Describe one method of N-T Terminal sequence analysis of peptide/protein which can be automated. (4)
 b) Write a scheme for the synthesis of Ala-Gly dipeptide. (4)
- Q.7.** a) Describe Merrifield's method for solid phase synthesis and explain advantage of Fmoc group have since made it group of choice. (4)
 b) Polylysine exist as a random coil at pH = 7 but spontaneously form an alpha helix at pH = 12 explain. (4)
