M.Sc. Physics Semester-IV
Semester Examination, June.-2021

Subject- Physics

Paper-I

Paper Title- Computational Methods and Programming

[Maximum Marks : 80

Time : 3 Hours]

[Minimum Pass Marks : 29

नोट : किन्हीं चार प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।
Note: Attempt any Four question. All questions carry equal marks.

Q-1 a. Draw the flow chart and write a programme to find the largest number among the given three numbers.   10

b- Describe about C constant and variables in details.   10

Q. 2 a. Explain subroutines and functions with the help of suitable examples.   10

b- Describe about file processing and local declaration in details.   10

Q-3 a- Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ 10

b- Find a real root of the equation $x^3 - 9x + 1 = 0$ if the root lies between 2 and 4 ley the method of false position correct to three daimat places.   10

Q-4 a- Find the real root of the equation $Xe^x - 2 = 0$ correct to two decimal places, using Newton rapison method.   10

b- find a real root of the equation $f(x) = x^3 + x^2 - 1 = 0$ by the method of Iteration.   10

Q- 5 a- Solve the following system of equation

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

Using Gaussian Elimination method.

B- Use the Gaussian Elimination method to find the inverse of the matrisx   10

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & 1 \\ 3 & 5 & 3 \end{bmatrix}$$

Q. 6 a- Find the eigen value of largest meddlers and the associated eigen vector of the matmix   10

$$A = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$$

by power method.

b- find all the eigen values and the corresponding eigen vectors of the matinx   10

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

by Jacobi's method.

Q- 7 a- Using the method of least squares, find the straight line Y=ax+b, that fits the following data: 10

X:	0.5	1.0	1.5	2.0	2.5	3.0
Y:	15	17	19	14	10	7

b- solve the following differential equation $\frac{by}{dt} = t+y$ with the initial.   10

condition y(0) =1 using fourth order Runge-kutta method from t=0 to t=0.4 taking r=0.1

Q-8 a- given y=-y and y (0)=1 determine the values of y at n=(0.01) and (0.02) by euler's method.   10

b- A missile is launched from a ground station. The acceleration during its first 80 seconds of fhight , as recorded, is given in the following table: 10

t(s)	0	10	20	30	40	50	60	70	80
A(m/s²)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Computel the velocity of missile when t=80s using Simpson's $\frac{1}{3}$ rule.

M.Sc. MATHS (IV-Semester)
Examination, June.-2021
PAPER-I
FUNCTIONAL ANALYSIS-I

Time : 2.30 Hours]

[Maximum Marks : 80
[Minimum Pass Marks : 29

Note : Attempt any Four questions. All questions carry equal marks.

1. State and prove the closed Graph theorem.

2. (a) If p is a projection on Hilbert space H with range M and null space N, then show that $M \perp N$ if and only p is self-ad joint.
   (b) Prove that the projection operators P_1 and P_2 are orthogonal if and only if the corresponding subspaces L_1 and L_2 are orthogonal.

3. (a) Let M be a closed linear subspace of a Hilbert space H and T be an operator on H. Prove that M is invariant under T iff $M^\perp$ is invariant under T^*.
   (b) If P is the projection on a closed linear subspace M of a Hilbert space H, then show that M reduces an operator $T \Leftrightarrow TP = PT$.

4. (a) Let T be a self adjoint operator on a Hilbert space H. then show that all its eigenvalues real and eigenvectors corresponding to different eigenvalues are orthogonal.
   (b) If T is a normal operator on a Hilbert space H, then show that the eigenspaces of T are pairwise orthogonal.

5. State and prove Hahn-Banach theorem for normed linear space.

6. Let T be a normal operator on a finite dimensional Hilbert space H with spectrum $\{\lambda_1, \lambda_2, \lambda_3, \ldots \ldots \ldots \ldots \ldots, \lambda_m\}$.
   Then prove that the following statements:
   (i) T is self-adjoint $\Leftrightarrow$ each λ_i is real;
   (ii) T is positive $\Leftrightarrow$ each $\lambda_i \geq 0$;
   (iii) T is unitary $\Leftrightarrow$ $|\lambda_i| = 1$ for each;

7. (a) Show that an operator T on a finite dimensional Hilbert space H is normal $\Leftrightarrow$ its adjoint T^* is a polynomial in T.
   (b) Let T and T' be operators on Hilbert space H. then show that
   (i) det $(I) = 1$, where I is the identy operator
   (ii) det $(II') = $ det (T) det (T')
   (iii) det $(T) \neq 0 \Leftrightarrow T$ is non-singular

8. (a) Prove that in a normed linear space, strong convergence implies weak convergence, but the convergence need not be true.
   (b) In a finite dimensional normed space show that weak convergence implies strong convergence.

M.Sc. SEMESTER – II EXAMINATION JUNE-2021

Subject- Chemistry   Paper- I

Paper title- Inorganic Chemistry - II

Time- 03 Hours   Maximum Marks- 80   Minimum Marks- 29

नोट :– किन्हीं चार प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।

Note:- Attempt any FOUR questions. All questions carry equal marks.

Q.1 (a) Discuss mechanism of substitution reactions in square planar complexes.

   (b) Discuss inner sphere type reactions.

Q.2 Write notes on any two of the following:-

   a) Metalloboranes

   b) Boran Hydrides

   c) Halide type cluster

Q.3 (a) Discuss factors affecting the stability of metal complexes with reference to the nature of metal ion and ligond.

   (b) Discuss determination of binry formation constants with special reference to pH meter.

Q.4 Write notes on any two of the following:-

   a) Spin orbit coupling

   b) Magnetic properties of free and complexes ion

   c) Magnetic property of teteagondly distorted sequence planer and trigonal bipyramidial complexes based on crystal field theory

Q.5 Write notes on any two of the following :-

   a) Mechanism of one electron transfer reaction

   b) Cross reaction and Marcus Hush theory

   c) Outer sphere type reactions

Q.6 (a) Discuss orgel and tanabe sugano diagrams for tetrahedral metal complexes.

   (b) Discuss interpretation of crystal field diagram for d^n configuration in octahedral field.

Q.7 (a) Discuss conjugate base mechanism. Write direct and indirect evidences in fauor of conjugate mechanism.

   (b) Discuss chelate effect with examples.

Q.8 Write notes on any two of the following :-

   a) Kineties of octahedeal substitution

   b) Factors affecting acid and base hydrolyris

   c) Kinetic application of Valence bond and Crystal field theories

Subject- Chemistry   Paper- I
Paper title- ANALYTICAL CHEMISTRY
Time- 03 Hours   Maximum Marks- 80   Minimum Marks- 29

नोट:– किन्हीं चार प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।
Note:- Attempt any FOUR questions. All questions carry equal marks.

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1. Differentiate between:-   **20**

(i) Accuracy and Precision
(ii) Indeterminate and Determinate error
(iii) Confidence limit and Confidence level
(iv) Mean and Median

2. (a) What is peptisation? How is it avoided during estimation?   **8**

(b) Define following with the example:-   **12**
(i) Milli mole   (ii) Milli formula weight
(iii) Parts per million   (iv) Titration error

3. Discuss on chromatographic methods for the identification of chlorinated and organophosphates pesticides in foods?   **20**

4. (a) Distinguish between the end point and equivalence point in a titration?   **(5x4=20)**
(b) How many moles and how many milli moles are contained in 100gm of dry ice(CO_2)?
(c) Calculate the standard deviation for an element whose percentage in sample were found to be 18.8, 19.6, 20.1, 20.0, 21.3, 19.9 and 20.8%?
(d) Describe the preparation of 800ml of 0.05 KOH from a 6.00M solution?

5. Describe the method for the determination of hardness and phosphate in water sample?   **20**

6. Explain the following:-   **20**
(i) Water Pollutants
(ii) Instrumental Techniques used for the analysis of heavy metals in aqueous systems

7. Explain the analysis of Soils in details. (With respect to moisture, pH, nitrogen, phosphorous, silica content)   **20**

8. Write short notes on the following:-   **(5x4=20)**

(i) Common ion effect
(ii) Complexometic Titration
(iii) Theory of redox indicators
(iv) Theory of adsorption indicators

3144-M.Sc. BOTANY SEMESTER – IV
SEMESTER EXAMINATION JUNE-2021

Subject- Botany   Paper- I
Paper title- PLANT BIOTECHNOLOGY
Time- 03 Hours   Maximum Marks- 80   Minimum Marks- 29

नोट:– किन्हीं चार प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।
Note:- Attempt any FOUR questions. All questions carry equal marks.

प्रश्न 1 जैव–प्रौद्योगिकी के महत्व पर एक निबंध लिखिए?

Write an essay on importance of Biotechnology?

प्रश्न 2 कोशिकीय विभेदन की अवधारणा को समझाइए?

Describe the concept of cellular differentiation?

प्रश्न 3 ऊतक संवर्धन के आधारभूत आवश्यकताओं का सामान्य विवरण दीजिए?

Give the general account of basic requirements for tissue culture?

प्रश्न 4 निम्न पर संक्षिप्त टिप्पणी लिखिए–

Write short notes on the following-
(a) परागकोष संवर्धन   **Anther Culture**
(b) भ्रुण संवर्धन   **Embryo Culture**

प्रश्न 5 जैव–प्रौद्योगिकी के मुख्य उपलब्धियाँ बताइए?

Give the salient achievements of Biotechnology?

प्रश्न 6 जीवद्रव्यों के पृथक्करण एवं संयुजन को समझाइए?

Describe the isolation and fusion of protoplasts?

प्रश्न 7 द्वितीयक उपापचयज के उत्पादन को समझाइए?

Describe the production of secondary metabolites?

प्रश्न 8 जननद्रव्य संचयन को समझाइए?

Describe the germplasm storage?

M.Sc. SEMESTER – II EXAMINATION JUNE-2021

Subject- Botony   **Paper- I**
Paper title- Gymnosperms
Time- 03 Hours   **Maximum Marks- 80   Minimum Marks- 29**

नोट :– किन्हीं चार प्रश्नों के उत्तर दीजिए। सभी प्रश्नों के अंक समान है।
Note:- Attempt any FOUR questions. All questions carry equal marks.

Q.1 Give an account of evolution of gymnosperms?

Q.2 Give an account of distribution of gymnosperms in India?

Q.3 Give a brief account of family caytoriaceae?

Q.4 Give a brief and general account of Williamsonia?

Q.5 Write short note on:-
  i.   Corallaid root of cycaas
  ii.   Dwarf shoot of Pimus

Q.6 Explain the life cycle of Ephedra?

Q.7 Explain the life cycle of wehritschia?

Q.8 Give the general account of economic importance of gymnosperms?