Unit II

4. What are check boxes and frames ? Discuss. Also explain how can you set a border.   **8**

5. What is shape and line control ? Explain. Give properties of multiple control.   **8**

Unit III

6. What is Variable ? How is it declared ? Give its types. Discuss with example conversion of variable types.   **8**

7. Differentiate between logical and relational operators in detail. Also discuss I/O controls in VB.   **8**

Unit IV

8. What are decision and conditions used in VB ? Explain looping statements with types and example.   **8**

9. What are Arrays ? How are they declared ? Discuss one-dimensional and multi-dimensional arrays with example.

8

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B.Sc. (C.S.) EXAMINATION, May 2023

(Sixth Semester)

CSC-302A

Visual Basic Programming

Time : 3 *Hours*   *Maximum Marks* : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What is immediate window in VB ? Discuss its significance.

   (b) How can one access the keyboard in VB ? Discuss.

   (c) State and explain print statement.

   (d) Define static array with example.   **4×2=8**

Unit I

2. What is visual programming ? Differentiate between procedural, object driven and event driven programming languages ?   **8**

3. Discuss VB environment and features of menu bar, project explorer, properties window in detail.   **8**

B. Sc. (C.S.) EXAMINATION, May 2023

(Sixth Semester)

SOFTWARE ENGINEERING

CSC-302B

Time : 3 Hours   *Maximum Marks : 80*

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. Attempt all questions :   **8×2=16**

    (a)   Define Software Engineering.

    (b)   Define Spiral Model.

    (c)   Define Data Modeling.

    (d)   Define DFD.

    (e)   What do you mean by Software Quality ? Explain.

    (f)   Define Size Metrics.

    (g)   What is Software Reliability ? Explain.

    (h)   Define Cohesion and Coupling.

Unit I

2. What do you mean by Software and Software Engineering ? Explain Software Processes and Software Crisis.   **16**

3. What is Software Life-Cycle Models ? Explain any *two* models in detail. 16

Unit II

4. What is Software Requirement Analysis ? Explain. 16

5. Write notes on the following : 2×8=16

(a) Data Dictionaries

(b) Requirement Engineering.

Unit III

6. Write notes on the following : 2×8=16

(a) COCOCMO Model

(b) Software Quality Assurance.

7. Explain the following : 2×8=16

(a) Role of metrics and measurement

(b) Function Point Analysis.

Unit IV

8. Discuss the concept of Software Reliability and Availability in detail. 16

9. Write notes on the following : 2×8=16

(a) Function Oriented Design *vs.* Object Oriented Design

(b) Software design fundamentals and Principles.

Section IV

7. (a) Let V (F) be an inner product space. If $u, v \in V$ such that $| < u, v > | = \| u \|.\| v \|$, then show that u and v are linearly dependent. **4.5**

   (b) Let S be a subset of an inner product space V. Then show that $S^{\perp} = S^{\perp\perp\perp}$. **4**

8. (a) State and prove Gram-Schmidt orthogonalization process. **4.5**

   (b) Prove that a linear operator T on a finite dimensional inner product space V is unitary if and only if T takes an orthonormal basis of V onto an orthonormal basis of V. **4**

Section V

(Compulsory Question)

9. (a) Define linear dependence and independence of vectors of a set. **1.5**

   (b) Define Rank and Nullity of a linear transformation. **1.5**

   (c) Define eigen values and eigen vectors of a Linear transformation. **1.5**

   (d) Find the norm of the vector $u = (2, -3, 6)$ and normalize this vector. **1.5**

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B. Sc. (N.M. & C.S.) EXAMINATION, May 2023

(Sixth Semester)

LINEAR ALGEBRA

MAT-302B

Time : 3 Hours   *Maximum Marks :* 40

Note : Attempt *Five* questions in all, selecting *one* question each from Section I to Section IV. Section V is compulsory.

Section I

1. (a) Prove that the union of two subspaces is a subspace if and only if one is contained in the other. **4.5**

   (b) Prove that in a vector space V, L (S) is the smallest subspace containing S. **4**

2. (a) Determine a basis of the sub-space spanned by the vectors (3, 2, 4), (1, 0, 2), (1, -1, -1) and (6, 7, 5). **4.5**

   (b) If V is a vector space of all 2×2 matrices over R and W is the set of all 2×2 diagonal matrices over R, then show that W is a subspace of V. Also find the basis of dim V/W. **4**

3. (a) Show that linear transformation $T : R^2 \to R^2$ defined by :

$$T(x_1, x_2) = (x_1 \cos\theta + x_2 \sin\theta, -x_1 \sin\theta + x_2 \cos\theta)$$

is a vector space isomorphism. **4.5**

(b) Let the transformation $T : R^3 \to R^3$ such that

$$T(X) = AX, \text{ where } A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 1 & 1 \\ 3 & 2 & 3 \end{bmatrix}. \text{ Find (i) the}$$

image of X = (1, 1, 2), (ii) the vector X whose image is (–2, –5, –5). **4**

4. (a) Let $T : R^4 \to R^3$ is a linear transformation defined by :

$$T(e_1) = (1, 1, 1), \quad T(e_2) = (1, -1, 1),$$

$$T(e_3) = (1, 0, 0), \quad T(e_4) = (1, 0, 1),$$

then verify that :

$$\rho(T) + \mu(T) = \dim R^4 = 4.$$ **4.5**

(b) Let V(F) be a finite dimensional vector space. If $V = W_1 \oplus W_2$, where W_1, W_2 are subspaces of V, then $V^* = A(W_1) \oplus A(W_2)$. **4**

5. (a) Given the linear transformation $Y = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 3 & 1 \\ -2 & 3 & 5 \end{bmatrix} X$.

Show that :

(i) It is singular

(ii) The images of linearly independent vectors :

$$X_1 = (1, 1, 1), X_2 = (2, 1, 2), X_3 = (1, 2, 3)$$

are linearly dependent. **4.5**

(b) If the matrix of a linear transformation T on R^3 relative to the ordered basis :

$$B = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\} \text{ is } \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & -1 \\ -1 & -1 & 0 \end{bmatrix}$$

Find the matrix of T relative to the basis $B' = \{(0, 1, -1), (-1, 1, 0), (1, -1, 1)\}$. **4**

6. (a) Define Similar matrices. Prove that similar matrices have same characteristic polynomial. **4.5**

(b) For the linear operator $T : R^3 \to R^3$, find the eigen values and the basis for eigen space, when $T(x, y, z) = (x + y + z, 2y + z, 2y + 3z)$. **4**

(b) A particle is projected from an apse at a distance a from the origin with a velocity which is $\sqrt{2}$ times the velocity for a circle of radius a and moves with central acceleration μr^{-3}. Show that the path is

$$r \cos\left(\frac{\theta}{\sqrt{2}}\right) = a.$$ **4**

8. (a) If a planet were suddenly stopped in its orbit when at a distance 'a' from the sun, show that it would fall in the sun in time $\dfrac{\sqrt{2}\pi a^{3/2}}{4\sqrt{\pi}}$ which is $\dfrac{\sqrt{2}}{8}$ times the period of the planet's revolution.   **4½**

(b) Find the acceleration of a particle in terms of cylindrical polar co-ordinates.   **4**

Section V
(Compulsory Question)

9. (a) Define Simple Harmonic Motion.   **1½**

(b) State Newton's second law of motion.   **1½**

(b) Define projectile, trajectory and angle of projection.   **1½**

(c) State Newton's law of Gravitation.   **1½**

B.Sc. (N.M. & C.S.) EXAMINATION, May 2023
(Sixth Semester)
DYNAMICS
MAT302C

Time : 3 Hours   *Maximum Marks : 40*

Note : Attempt Five questions in all, selecting one question each from Section I-IV and the compulsory question from Section V.

Section I

1. (a) A particle moves along the curve $x = 4t$, $y = 6t - t^2$. Find the tangential and normal acceleration at $t = 3$.   **4½**

(b) A ship steams the west with a velocity of 15 km/hr relative to the current which is flowing at the rate of 6 km/hr due south. What is the velocity of a train going north at a rate of 30 km/hr relative to the ship ?   **4**

2. (a) A particle moving with S.H.M. of period 12 seconds travels 10 cm from the position of rest in 2 seconds. Find the amplitude, the maximum velocity and the velocity at the end of 2 seconds.   **4½**

(b) A light elastic string of length 4 m has one end fixed at A and to the other end is attached a mass, which in equilibrium extends the string by 1 m. If the stone be dropped from A, find the maximum extension produced. **4**

Section II

3. (a) A load W is to be raised by a rope from rest to rest through a height 'h' and the greater tension which the rope can safety bear is nw. Show that the time in which the ascent can be made is $\sqrt{\dfrac{2nh}{g(n-1)}}$. **4½**

(b) A ball of mass $\dfrac{1}{2}$ pound falls freely under gravity through a distance of 25 ft. In the process of catching, a man allows his hand to drop a distance of 1 foot. Find the average pressure on his hand during the catch. **4**

4. (a) State and prove principle of work and energy. **4½**

(b) A mass of 10 lbs falls 100 feet and is brought to rest by penetrating 1 foot into sand. Find the resistance of the sand. **4**

Section III

5. (a) A particle slides down a catenary, whose plane is vertical and vertex upwards, the velocity at any point being due to fall from the directrix. Prove that pressure at any point varies inversely as the distance of that point from the directrix. **4½**

(b) A particle slides down the arc of a smooth cycloid, whose axis is vertical and vertex downwards. Discuss the motion. **4**

6. (a) How must a ball be projected from a height of 4 ft, so as just to clear a wall 13 ft. high, distant 15 ft. in a horizontal direction and a ditch 5 ft. wide on the other side of the wall. **4½**

(b) A shell bursts on contact with the ground and fragment fly in all directions with all speeds upto 80 ft./sec. Show that a man 100 ft away is in danger for $\dfrac{5}{\sqrt{2}}$ seconds. **4**

Section IV

7. (a) A particle moves in an ellipse under a force which is always directed towards its focus; find : **4½**
    (i) The law of force
    (ii) The velocity at any point of its path
    (iii) The periodic time.

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B.Sc. (N.M. & M.S.) EXAMINATION, May 2023

(Sixth Semester)

PHYSICAL CHEMISTRY

CHE-302B

Time : 3 Hours   *Maximum Marks : 27*

Note :   Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. **1** is compulsory.

(Compulsory Question)

1. (a)   What is Born-Oppenheimer approximation ?

   (b)   Define intersystem crossing.

   (c)   Explain Grotthus Draper law.

   (d)   Define osmotic pressure.

   (e)   What is abnormal molar mass ?

   (f)   What is eutectic mixture ?

   (g)   What is thaw point ? $1 \times 7 = 7$

Section I

2. (a)   Discuss Franck-Condon Principle.   **3**

   (b)   What are selection rule for electronic transitions ? **2**

3. (a) Discuss the various electronic transitions involved in the molecular orbital formation. **3**

(b) What are the "term symbols" of molecules in electronic spectroscopy ? **2**

Section II

4. (a) Explain in detail the Jablonski diagram. **3**

(b) Explain why photosynthesis of HCl has very high quantum yield while that of HBr has very low ? **2**

5. (a) Explain the phenomenon of fluorescence and phosphorescence, **3**

(b) Briefly explain photosensitized reactions with examples. **2**

Section III

6. (a) State and explain Raoult's law for volatile solutes. **3**

(b) How osmotic pressure is measured by Barkeley and Hartley's method ? **2**

7. (a) What are colligative properties ? Briefly discuss the elevation in boiling point. **3**

(b) Explain the terms Chemical potential, fugacity, activity and activity coefficient. **2**

Section IV

8. (a) Draw a well labeled phase diagram of water system and discuss in brief. **3**

(b) Write a short note on Disilverization of lead. **2**

9. (a) Define Gibbs phase rule. Derive it thermodynamically. **3**

(b) Briefly discuss the triple point. **2**

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B. Sc. (N. M. & M. S.) EXAMINATION, May 2023

(Sixth Semester)

ORGANIC CHEMISTRY

CHE-302C

Time : 3 Hours   *Maximum Marks : 26*

Note : This question paper consists of nine questions. Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. **1** is compulsory.

(Compulsory Question)

1. (a)   What is sulphur ylide ?

    (b)   Compare the basicity of pyridine and pyrrole.

    (c)   Define active methylene compound.

    (d)   What is Zwitter ion in reference to amino acid ?

    (e)   Name the monomers used in preparation of Bakelite.

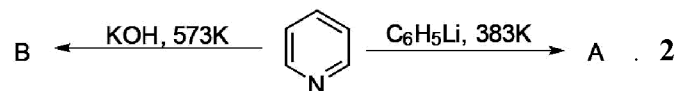   (f)   Write the structure and name of the monomer of Nylon 6.   **6×1=6**

Section A

2. (a)   Explain the electrophilic substitution reaction in Pyridine.   **3**

(b) Explain Chichibabin reaction. **2**

3. (a) Write the mechanism for electrophilic substitution in Thiophene. **3**

(b) Write the product A and B in the following reaction :

B ←— KOH, 573K —— $\langle N \rangle$ —— C₆H₅Li, 383K —→ A . **2**

Section B

4. (a) Explain Bischler-Napieralski synthesis with mechanism. **3**

(b) What happens when quinoline reacts with $KMnO_4$. **2**

5. (a) Write the preparation and use of sulphonamides. **3**

(b) Write a short note on detergents. **2**

Section C

6. (a) How to prepare succinic acid from acetoacetic ester synthesis ? **2**

(b) Describe the mechanism of cationic vinyl polymerization. **3**

7. (a) Write the methods for the preparation of PMMA and Teflon. **3**

(b) Write the methods for the preparation of styrene, butadiene and neoprene. **2**

Section D

8. (a) Give *two* examples of acidic amino acids. **2**

(b) Explain Edman method of N-terminal residue analysis. **3**

9. (a) Write a brief note on solid phase peptide synthesis. **2**

(b) Explain Sanger's method of N-terminal residue analysis. **3**

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B. Sc. (M.S.) EXAMINATION, May 2023

(Sixth Semester)

ECONOMIC ZOOLOGY–II

ZOO-302A

Time : 3 Hours   *Maximum Marks : 40*

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory consisting of ten parts. Answer to each part should not exceed **20** words. Out of remaining eight questions, attempt *four* questions, selecting *one* from each Unit.

1. Write short notes on the following :   **10×1=10**

   (a)   Riverine fisheries

   (b)   Composite culture

   (c)   Pig house

   (d)   Fishing gears

   (e)   Hatching

   (f)   Fish meal

   (g)   Example of fin fishes

   (h)   Poultry feed

   (i)   Life span of pig

   (j)   Crustaceans.

Unit I

2. Describe different fresh water fishes in India and their distribution. **7.5**

3. Write short notes on the following :
   (a) Fishing crafts **3.5**
   (b) Pond/Tank Fisheries. **4**

Unit II

4. Write short notes on the following :
   (a) Differentiate Composite culture and Monoculture in Fisheries **4**
   (b) Fish culture technology. **3.5**

5. Briefly explain the following :
   (a) Different types of fish feeds **4**
   (b) Fin fish and Molluscs culture. **3.5**

Unit III

6. Explain different types of foods and feeding methods of fowl. **7.5**

7. Write short notes on the following :
   (a) Different breeds of fowl **3**
   (b) Hatching and rearing of chicken. **4.5**

Unit IV

8. Describe housing and feeding of Piggery. **7.5**

9. Write short notes on the following :
   (a) Different breeds of Pigs **3.5**
   (b) Important products obtained from Piggery. **4**

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B.Sc. (M.S.) EXAMINATION, May 2023

(Sixth Semester)

BIOTECHNOLOGY AND BIOINFORMATICS

ZOO-302B

Time : 3 Hours   *Maximum Marks : 40*

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory consisting of ten parts. Answer to each part should not exceed **20** words. Out of remaining eight questions, attempt *four* questions, selecting *one* question from each Unit.

1. Write short notes on the following :   **10×1=10**

    (a)   Vector

    (b)   Ligase

    (c)   Operon

    (d)   Karyotype

    (e)   DNA Cloning

    (f)   Monoclonal antibody

    (g)   Role of Inducer in gene regulation

    (h)   Gene library

    (i)   Denaturation

    (j)   Nucleoside.

Unit I

2. Explain the major scopes of Biotechnology emphasizing its historical background. **7.5**

3. Write short notes on the following :
   (a) Passenger DNA **3**
   (b) Examples of most commonly used enzymes. **4.5**

Unit II

4. Write short notes on the following :
   (a) Isolation and purification of Nucleic acids **4**
   (b) DNA sequencing. **3.5**

5. Briefly explain the following :
   (a) Procedure of chemical synthesis of DNA **3**
   (b) Blotting technique of Nucleic acids. **4.5**

Unit III

6. Explain the Lac Operon system. How is it useful in understanding the mechanism of gene regulation ? **7.5**

7. Write short notes on the following :
   (a) Radiolabeling of Nucleic acids **4.5**
   (b) Process of copying of mRNA into DNA. **3**

Unit IV

8. Explain the main components of Bioinformatics. How the use of computer is useful in Zoology ? **7.5**

9. Write short notes on the following :
   (a) Tissue and Organ culture **3.5**
   (b) In-vitro fertilization. **4**

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B.Sc. (M.S.) EXAMINATION, May 2023

(Sixth Semester)

PLANT ECOLOGY

BOT-302A

Time : 3 Hours   *Maximum Marks : 40*

Note :   Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks. Draw neat and labeled diagrams wherever required.

(Compulsory Question)

1. (a)   Differentiate Autecology and Synecology.
   (b)   Define Ecotone and Edge effect.
   (c)   What is Gause Principle ?
   (d)   Define Stratification.
   (e)   What is a food web ? Name any *one* food web.
   (f)   What is greenhouse effect ?
   (g)   What do you mean by Anthropogenic pollution ?
   (h)   Who has given the term Ecosystem ?   **1×8=8**

Unit I

2. (a)   Explain the physico-chemical properties of soil. **4**
   (b)   Discuss about the role of Temperature as a climatic factor.   **4**

3. (a) Describe the topographic factors affecting living organisms. **4**

(b) How the animals influence the vegetation of a place ? **4**

Unit II

4. (a) Discuss about the ecological adaptations in Xerophytes. **4**

(b) Give the various categories of hydrophytes along with diagrams. **4**

5. Write notes on the following : **2×4=8**

(a) Growth Curves

(b) Mortality and Natality

(c) Biotic Potential.

(d) Ecological Indicators

Unit III

6. Give an account of analytical and synthetic characters of a plant community. **8**

7. (a) Write a note on sequential stages of a typical hydrosere. **4**

(b) Define Phytogeography. Describe the major phytogeographical regions of India. **4**

Unit IV

8. Write notes on the following : **2×4=8**

(a) Ozone layer depletion

(b) Ecological Pyramids.

9. Define Pollution. What are the major sources of water pollution ? Discuss about the nature of pollutants involved and give the control measures. **8**

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B. Sc. (M.S.) EXAMINATION, May 2023

(Sixth Semester)

ECONOMIC BOTANY

BOT-302B

Time : 3 Hours　　　　　　　　　　*Maximum Marks :* 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory and short answer type. All the questions carry equal marks. Draw neat and labeled diagrams wherever required.

(Compulsory Question)

1. (a)　Who has given the monophyletic origin of plant species ?

　　(b)　Name the plant part from which opium is obtained.

　　(c)　Name the commercially important species of Cotton.

　　(d)　What is the vulcanization process ?

　　(e)　Give the chemical structure of Zingeron.

　　(f)　Give the botanical name and family of Sal wood.

　　(g)　From which part oil is obtained in coconut plant.

　　(h)　What is the Oolong Tea ?　　　　**8×1=8**

Unit I

2. (a) Explain in detail the cultivation, climate and soil and morphological characters of Potato. 4

   (b) Discuss about the origin and spread and uses of Maize. 4

3. (a) Write about the source of fibre, climate and soil and botanical description of Cotton. 5

   (b) Explain about the fiber extraction and characters of Jute fibre. 3

Unit II

4. (a) Write botanical name, family, oil yielding part and uses of Groundnut. 4

   (b) Discuss about the history and botanical description of Mustard and Coconut. 4

5. (a) Give botanical name, climate and soil, characteristics and uses of (a) Sal and (b) Shisham. 4

   (b) Explain about the characteristics of Wood. 4

Unit III

6. Write notes on the following : 2×4=8

   (i) Turmeric

   (ii) Coriander.

7. Give the general account of the following medicinal plants : 2×4=8

   (i) Opium

   (ii) Belladona.

Unit IV

8. (a) What are Beverages ? Discuss about the origin and spread and cultivation of Tea. 4

   (b) Discuss about the botanical description, processing and uses of Coffee. 4

9. (a) Give historical account and botanical description cultivation of Rubber Plant. 4

   (b) Discuss about the tapping and processing and uses of Rubber. 4