

Total No. of Questions : 3]

SEAT No. :

PE1416

[Total No. of Pages : 1

[6501]-401

S.Y. B.Sc. (Regular/Comp.Sc./Biotech/Animation/Computer

Applications/Cyber & Digital/Biotechnology)

LANGUAGE - ENGLISH

Ability Enhancement Compulsory Course - IV

(2019 Pattern) (Credit System) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any one of the following in about 150-200 words. [15]

- a) Discuss the metaphorical significance of the 'garden' and the 'sanctuary' it provides in the poem. 'The Bird Sanctuary'.
- b) Discuss the role of the 'nature' in the poem 'Stopping By Woods on a Snowy Evening' and how it reflects the speaker's state of mind.

Q2) Attempt any two of the following in about 50-80 words. [10]

- a) Write a short note on basics of 'content writing'.
- b) As a cultural co-ordinator of the college, draft a notice informing students about a special poetry appreciation session to be conducted in your college.
- c) As a chairman of your housing society, draft an agenda for the meeting to be held for the planning of 'Ganesh Festival'.

Q3) Attempt any two of the following in about 50-80 words. [10]

- a) What is the difference between verbal and non-verbal communication?
- b) Discuss the basic elements of SWOT/C analysis.
- c) What do you understand by goal setting?

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Total No. of Questions : 3]

SEAT No. :

PE1417

[Total No. of Pages : 1

[6501]-402

S.Y.B.Sc. (Regular/Cyber & Digital)

MARATHI (मराठी)

AECC-IV-B : मराठी साहित्य

(2019 Pattern) (CBCS) (Semester - IV) (24331) (Theory)

वेळ : 2 तास/

/एकूण गुण : 35

- सूचना : 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.
2) उजवीकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

प्र.1) खालीलपैकी कोणत्याही एका विषयावर 300 शब्दांत निबंध लिहा.

[10]

- अ) नवसमाजमाध्यमे आणि आजचा युवक
- ब) आत्मनिर्भर भारत
- क) मतदान जागृती : काळाची गरज

प्र.2) खालीलपैकी तीन प्रश्नांची उत्तरे 100 शब्दांत लिहा.

[15]

- अ) एका यंत्रमानवाच्या मनाचा शोध या कथेतील विनोदाचे चित्रण करा.
- ब) सुबोध जावडेकर यांच्या 'पुढल्या हाका' ही शाश्वत मुल्यांची जाणीव करून देणारी कथा ठरते कशी ते थोडक्यात लिहा?
- क) बाबा भांड यांच्या 15 ऑगस्ट 1947 या कथेचे वेगळेपण विशद करा.
- ड) लीना मेहेंदळे यांच्या 'एक शहर मेले त्याची गोष्ट' या कथेचे कथानक थोडक्यात लिहा.
- इ) 'नांगरट' या कथेतील देवराव या शेतमजुराची व्यथा थोडक्यात लिहा.

प्र.3) खालीलपैकी कोणत्याही एका प्रश्नाचे उत्तर 300 शब्दांत लिहा.

[10]

- अ) एक विज्ञानकथा म्हणून 'अथेन्सचा प्लेग' या कथेचे कथानक लिहा.
- ब) दलित जीवनातील वेदना 'लिपण' या कथेतून कशा प्रकट झाल्या आहेत? ते लिहा.



Total No. of Questions : 3]

SEAT No. :

PE1418

[Total No. of Pages : 1

[6501]-403

S.Y. B.Sc. (Regular)

HINDI (हिंदी)

AECC-IV-C : हिंदी काव्य तथा कहानी साहित्य
(2019 Pattern) (CBCS) (Semester - IV) (24341)

पाठ्यपुस्तक : साहित्य संगम

– सं. प्रो. डॉ. सदानंद भोसले

समय : 2 घंटे/

/पूर्णांक : 35

सूचनाएँ : 1) सभी प्रश्न अनिवार्य हैं।
2) दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं।

प्र.1) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए।

[15]

- अ) 'झाँसी की रानी' कविता का भावार्थ लिखिए।
- ब) 'मधुशाला' कविता के माध्यम से कवि क्या कहना चाहते हैं?
- क) 'गीत फरोश' कविता का आशय स्पष्ट कीजिए।
- ड) 'भूख' कविता के माध्यम से कवि ने कौन-सा संदेश दिया है?
- इ) 'रोटी और संसद' कविता का मुख्य विषय क्या है?

प्र.2) निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर लिखिए।

[15]

- अ) 'बेटा' कहानी की कथावस्तु लिखिए।
- ब) 'पत्नी' कहानी के उद्देश्य पर प्रकाश डालिए।
- क) 'शर्त' कहानी के माध्यम से लेखक कौन-सा संदेश देना चाहता है?
- ड) 'स्वेटर' कहानी के अमोल का परिचय दीजिए।
- इ) 'ईश्वर का द्वंद्व' कहानी का मूल विषय क्या है?

प्र.3) निम्नलिखित में से किसी एक प्रश्न का उत्तर लिखिए।

[5]

- अ) 'रोटी और संसद' कविता राजनीति पर व्यंग्य करती है, स्पष्ट कीजिए।
- ब) कालिंदीचरण का चरित्र-चित्रण कीजिए।



Total No. of Questions : 4]

SEAT No. :

PE1419

[Total No. of Pages : 2

[6501]-405

S.Y.B.Sc. (Regular)

ARABIC

AECC-IV D-Language : Arabic Functional
(2019 Pattern) (Credit System) (Semester-IV) (24371)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *Figures to the right indicate full marks.*

Q1) Translate the following Passages into Urdu/English. (Any two) **[10]**

(a) انا وَلَدٌ. هَذَا فَارٌ. ذَلِكَ كَلْبٌ. ذَلِكَ حِمَارٌ. هَذَا رَجُلٌ. هَذَا جَمَلٌ. ذَلِكَ قِرْدٌ. اَنَا وَلَدٌ. أَنْتَ رَجُلٌ. ذَلِكَ فَرسٌ. هَذَا كِتَابٌ. اَنَا صَغِيرٌ. أَنْتَ كَبِيرٌ. هَلْ أَنْتَ صَغِيرٌ. هَذِهِ مَدْرَسَةٌ. الْقِرْدُ حَيَوَانٌ. الْأَدَبُ وَاجِبٌ. أَنْتَ طَوِيلٌ.

(b) الدَّرْسُ صَعْبٌ. الْعِلْمُ مُفِيدٌ. الْكِتَابُ عَرَبِيٌّ. اللَّعِبُ ضَرُورِيٌّ. الشَّجَرُ كَبِيرٌ. الْإِسْلَامُ مُفِيدٌ. ذَلِكَ الطَّائِرُ بِنَعَاءٍ. الْقَلَمُ فِي الْجَيْبِ. هَذَا الْقَفْصُ لِفَرِيدٍ. الْعَمَلُ ضَرُورِيٌّ لِلْعَالِمِ. الْبَيْتُ جَمِيلٌ. الْمُدَرِّسُ وَاقِفٌ. اَنَا مَشْغُولٌ بِالْقِرَاءَةِ.

(c) الْعِلْمُ نِعْمَةٌ لِلْإِنْسَانِ. الْقَلَمُ لَا زِمٌ لِلْكِتَابَةِ. الْأُسْتَاذُ جَالِسٌ عَلَى الْكُرْسِيِّ. اَدَبُ الْأُسْتَاذِ وَاجِبٌ. الدَّرْسُ سَهْلٌ لِلْوَلَدِ. أَيُّ شَيْءٍ فَوْقَ الطَّاوِلَةِ؟ فَصْلُ الشِّتَاءِ بَارِدٌ. السَّمَكُ فِي الْمَاءِ. الْكُرْسِيُّ عَلَى الْأَرْضِ. الرَّجُلُ وَاقِفٌ عَلَى الْأَرْضِ. الْوَلَدُ الْمُجْتَهِدُ مَحْبُوبٌ.

P.T.O.

Q2) Translate and explain the following poem “خَيْرُ الْخِصَالِ” into Urdu/Eng.

(Any Two)

[10]

خَيْرُ الْخِصَالِ الْآدَبُ	شَرُّ الْمَقَالِ الْكَذِبُ
وَالْجُودُ سِتْرٌ صَالِحٌ	الْبُخْلُ عَيْبٌ فَاضِحٌ
وَالْعُجْبُ دَاءٌ قَاتِلٌ	الْعَقْلُ قَاضٍ عَادِلٌ
وَالْمَالُ ظِلٌّ زَائِلٌ	الْعُمُرُ ضَيْفٌ رَاحِلٌ
إِنَّ الْبَخِيلَ لَا يُحِبُّ	الْبِرَّ لِلْحُبِّ سَبَبٌ
مِنْ كَرَمِ الْأَعْرَاقِ	طَهَارَةُ الْأَخْلَاقِ
وَالْعَذْرُ شَرُّ شَيْمَةٍ	الْكَذِبُ وَالنِّمِيمَةُ
لَا سِيَّمَا السُّرُورِ	تَأَنٍّ فِي الْأُمُورِ
مِنْ حَذَرِ الْفُؤَاتِ	وَأَعْجَلُ إِلَى الْخَيْرَاتِ

Q3) Answer the following in Arabic only. (Any Five)

[10]

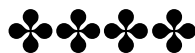
- | | | | |
|-----|---------------------|-----|--------------------------|
| (a) | مَا لِسَمِّكَ؟ | (b) | هَلْ أَنْتَ صَغِيرٌ؟ |
| (c) | أَيْنَ الْكِتَابُ؟ | (d) | أَيُّ حَيَوَانٍ طَوِيلٌ؟ |
| (e) | هَلْ ذَلِكَ قَلَمٌ؟ | (f) | كَيْفَ الرَّهْرُ؟ |
| (g) | أَيْنَ السَّمَكُ؟ | (h) | مَنْ أَنْتَ؟ |
| (i) | مَا فِي الْقَفْصِ؟ | | |

Q4) Write the letter in Arabic to your father.

[5]

OR

Write the name of Arabic months in Arabic.



Total No. of Questions : 5]

SEAT No. :

PE1420

[Total No. of Pages : 2

[6501]-406

S.Y. B.Sc. (Regular)

CHEMISTRY

CH-401 : Physical and Analytical Chemistry

(2019 Pattern) (CBCS) (Semester - IV) (Paper - I) (24131)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any five of the following: [5]

- a) What is mean by phase?
- b) What is fractionating column?
- c) The transmittance of solution of a substance was found to be 60% calculate absorbance.
- d) Write the unit of conductance.
- e) What is elution?
- f) Define critical solution temperature.

Q2) a) Attempt any two of the following: [6]

- i) State system, component and degree of Freedom.
- ii) State principle of fractional distillation with neat diagram.
- iii) What is cell constant? Give its units and how cell constant is determined.

b) Discuss the construction and working of photovoltaic cell. [4]

Q3) a) Attempt any two of the following: [6]

- i) Explain the method of separation of amino acids by Ion exchange chromatography.
- ii) Explain the phase diagram of water system.
- iii) Explain Phenol-Water system in detail.

b) Attempt the following: [4]

- i) The transmittance of $3 \times 10^{-4}M$ solution of a substance was found to be 85% at 420nm when placed in a cell of 1cm path length. Calculate absorbance and molar absorptivity.
- ii) The electrodes in the cell are 0.8cm apart and have an area of 0.7628 cm². What will be the cell constant?

P.T.O.

Q4) a) Attempt any two of the following. **[6]**

- i) Derive the expression of Gibb's phase rule.
 - ii) Explain the stationary and mobile phases in chromatography.
 - iii) Give the examples of three types of critical solution temperatures only with diagrams.
- b) The resistance of a conductivity cell filled with 0.02N solution of an electrolyte is 100 ohm at 25°C. Calculate specific conductance and equivalent conductance if cell constant is 2.06cm^{-1} . **[4]**

Q5) Write short notes on any four of the following. **[10]**

- a) Simple distillation
- b) Phototubes
- c) Conclusions of phase rule to water system
- d) Adsorption chromatography
- e) Conductometric titration of strong acid and weak base
- f) Size Exclusion chromatography



Total No. of Questions : 5]

SEAT No. :

PE-1421

[Total No. of Pages : 2

[6501]-407

S.Y. B.Sc.

CHEMISTRY

CH-402 : INORGANIC AND ORGANIC CHEMISTRY
(2019 Pattern) (Semester - IV) (CBCS) (24132) (Paper - II)

Time : 2 Hours]

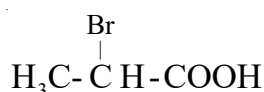
[Max. Marks : 35

Instructions to the candidates:

- 1) Q. 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.
- 4) Figures to the right indicate full marks.

Q1) Attempt any five of the following : **[5]**

- a) Identify the isomerism in following inorganic complexes.
 $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]^{2+}$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]^{2+}$
- b) Which 'd' orbital are doubly degenerate.
- c) What is Witting reaction.
- d) Define C.F.S.E.
- e) Write down IUPAC nomenclature of following compound.



- f) Write down the general formula of amine. Give one example of amine.

Q2) a) Attempt any two of the following : **[6]**

- i) Explain the ionization isomerism with suitable example.
- ii) Discuss the bonding in $[\text{Zn}(\text{NH}_3)_4]^{2+}$ complex in according to V.B. theory. (At Num of Zn = 30)
- iii) Calculate the C.F.S.E. for d^4 ion in high and low spin octohedral field.

b) Attempt the following : **[4]**

- i) Draw chair conformation of trans 1,2 dimethyl cyclohexane. Comment on their stability and optical activity.
- ii) Explain the term Angle strain.

P.T.O.

Q3) a) Attempt any two of the following : [6]

- i) What are amines? How they are classified?
- ii) What is carboxylic acid? Give the classification of carboxylic acid.
- iii) What are aldehydes? Explain Cannizzaro reaction with suitable example.

b) Attempt the following : [4]

- i) What are the limitations of C.F.T.
- ii) Arrange the following complex ions in increasing values of $10Dq$.
 $[\text{CrCl}_6]^{3-}$, $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{Cr}(\text{NH}_3)_6]^{3+}$

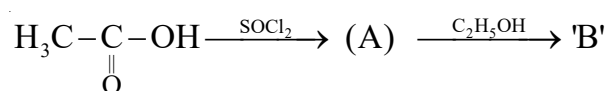
Q4) a) Attempt any two of the following : [6]

- i) Explain the bonding in the $[\text{MnCl}_4]^{2-}$ complex ion and comment on their magnetic properties. [Atomic number of Mn = 25].
- ii) Write short note on Reformatsky reaction.
- iii) Write short note on Wolff-Krishner reduction.

b) What is $10Dq$ or Δ_0 ? Explain factors affecting magnitude of $10Dq$ or Δ_0 . [4]

Q5) Attempt any four of the following : [10]

- a) Write a short note on spectrochemical series.
- b) Write the assumptions of UBT.
- c) Explain the application of CFT to 'oh' complexes.
- d) Identify the product 'A' and 'B' and rewrite the reaction.



- e) Draw the conformational isomers of 1,1 dimethyl cyclohexane. Comment on their stability,
- f) How will you convert following conversion.
 - i) Benzene to aniline.
 - ii) P-Chloroaniline to P-Chloroaniline.



Total No. of Questions : 5]

SEAT No. :

PE1422

[Total No. of Pages : 2

[6501]-408

S.Y. B.Sc. (Regular)

PHYSICS - I

PHY-241 : Oscillations, Waves and Sound

(2019 Pattern) (CBCS) (Semester - IV) (Paper - I) (24121)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any 3 questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*
- 4) *Use of calculator is allowed.*
- 5) *Figure to the right indicate full marks.*

Q1) Solve any five of the following:

[5]

- a) Define linear simple harmonic motion.
- b) Define quality factor.
- c) What is log decrement?
- d) Define intensity of wave. Give its unit.
- e) Calculate the change in intensity level when the intensity of sound increases by 1000 times the original intensity.
- f) What is Doppler effect?

Q2) a) Show that total energy of undamped simple harmonic oscillator is constant and proportional to the square of amplitude.

[6]

OR

The equation of motion for damped oscillations is given as

[6]

$$x = a_1 e^{\left(\frac{-R}{2m} + \sqrt{\frac{R^2}{4m^2} - \frac{k}{m}}\right)t} + a_2 e^{\left(\frac{-R}{2m} - \sqrt{\frac{R^2}{4m^2} - \frac{k}{m}}\right)t}$$

Discuss the three cases

- i) over damped
 - ii) critically damped
 - iii) under damped
- b) Explain optical method to obtain Lissajous figures.

[4]

P.T.O.

- Q3) a)** Obtain an expression for velocity of longitudinal waves propagating through a medium of density ρ and bulk modulus of elasticity k . [6]

OR

Show that the Doppler effect in sound is asymmetric. [6]

- b) $\phi = ae^{ik(x-ct)}$ does it represents the equation of wave motion. [4]

- Q4) a)** Define angular simple harmonic motion. Obtain an expression for period of oscillation and frequency of oscillation. [6]

OR

Show that the rate of absorption of energy is equal to the rate of dissipation of energy in case of forced oscillator. [6]

- b) The equation of damped motion is given as [4]

$$2\left(\frac{d^2x}{dt^2}\right) + 12\left(\frac{dx}{dt}\right) + 50x = 0$$

Find the frequency of damped oscillations

- Q5)** Write short notes on any four of the following. [10]

- a) Sound intensity
- b) P-waves
- c) Red shift
- d) Bartoris pendulum
- e) Power dissipation
- f) Define reverberation and reverberation time



Total No. of Questions : 5]

SEAT No. :

PE1423

[Total No. of Pages : 2

[6501]-409

S.Y. B.Sc. (Regular)

PHYSICS

PHY - 242 : Optics

(2019 Pattern) (Credit System) (Semester - IV) (Paper - II) (24122)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions No. 2 to 5 carry equal marks.*
- 4) *Use of calculator is allowed.*
- 5) *Figure to the right indicate full marks.*

Q1) Solve any five of the following. [5]

- a) What do you mean by Cardinal points?
- b) Define lens.
- c) What is an eyepiece?
- d) Calculate the focal length of plano - convex lens for which the radius of curvature is 25cm and refractive index of the material of the lens is 1.5.
- e) What is meant by resolving power of an optical instrument?
- f) State law of malus.

Q2) a) Prove that for a combination of two thin lenses of focal lengths F_1 and F_2 separated by distance X , the focal length of combination is given by [6]

$$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{X}{F_1 F_2}$$

OR

Explain the stoke's treatment of the phase change on reflection of light.

b) Explain construction and working of compound microscope. [4]

P.T.O.

- Q3) a)** Explain Brewster's law and describe how it can be used to produce plane polarized light. **[6]**

OR

Obtain the condition $2\mu t \cos \gamma = m\lambda$ for destructive interference in the reflected system of ray from thin film.

- b) The focal length of a lens in air is 15 cm. What will be its focal length, if air is replaced by water (R.I of glass = 1.45, R.I of water = 1.33) **[4]**

- Q4) a)** With neat ray diagram explain construction and working of Ramsden's eyepiece. **[6]**

OR

Derive the lens maker's formula for thin lens.

- b) Find the polarizing angle for light incident from water to glass and glass to water if refractive index of glass and water is 1.54 and 1.33 respectively. **[4]**

- Q5)** Write short note on any four of the following. **[10]**

- a) Concave lens and its types.
- b) Write note on polarization.
- c) Types of monochromatic Aberration.
- d) Applications of Newton's ring.
- e) Write note on Fraunhofer diffraction.
- f) Positive crystal.



Total No. of Questions : 4]

SEAT No. :

PE-1424

[Total No. of Pages : 3

[6501]-410

S.Y. B.Sc.

MATHEMATICS

MT-241 : Linear Algebra

(2019 Pattern) (CBCS) (Semester - IV) (24111)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any FIVE of the following :

[5]

- a) Find the solution set of $4x - 2y = 1$.
- b) Write $(3, 2)$ as a linear combination of vectors $(1, 0)$ and $(0, 1)$ in $\mathbb{R}^2$.
- c) Define basis.
- d) Write the standard basis for $\mathbb{R}^4$.
- e) Find nullity of the matrix A, if A is 4×6 matrix and $\text{rank}(A) = 3$.
- f) Define Linear Isomorphism.
- g) If $T_1 : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ and $T_2 : \mathbb{R}^3 \rightarrow \mathbb{R}^4$ then find domain for $T_2 \circ T_1$.

Q2) a) Attempt any ONE of the following :

[5]

- i) Prove that a set with exactly two vectors is linearly independent if and only if neither vector is a scalar multiple of other.
- ii) Let V be a vector space. If W_1 and W_2 are subspaces of a vector space V then show that $W_1 \cap W_2$ is a subspace of V. What about $W_1 \cup W_2$?

P.T.O.

b) Attempt any ONE of the following : [5]

- i) Solve the following system of linear equations using Gaussian - elimination method.

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

$$x + 2y + z = -1$$

$$2x + y - 6z = 4$$

- ii) Solve the following system.

$$2x + y + z = 0$$

$$x + 3y = 0$$

$$y + z = 0$$

Q3) a) Attempt any ONE of the following : [5]

- i) Let V be n dimensional vector space and $S = \{V_1, V_2, \dots, V_r\}$ be linearly independent set in V then S can be extended to a basis $S' = \{V_1, V_2, \dots, V_r, V_{r+1}, \dots, V_n\}$ of V .

- ii) If A and B be two matrices of order $m \times n$, then show that $\text{rank}(A + B) \leq \text{rank}(A) + \text{rank}(B)$.

b) Attempt any ONE of the following : [5]

- i) If $W = \{(x, y, z) \in \mathbb{R}^3 \mid 2x + 3y + 4z = 0\}$ then show that W is a subspace of $\mathbb{R}^3$.
- ii) Find basis for row space of matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 1 & 5 \\ 2 & 1 & 3 & 1 & 4 \\ 1 & 1 & 2 & 1 & 3 \end{bmatrix}$$

Q4) a) Attempt any ONE of the following : **[5]**

- i) Let $T_1 : U \rightarrow V$ and $T_2 : V \rightarrow W$ be two linear transformations then show that the composite transformation $T_2 \circ T_1 : U \rightarrow W$ is also a linear transformation.
- ii) Let $T : V \rightarrow W$ be a linear transformation then prove that the Kernel of T is a subspace of V .

b) Attempt any ONE of the following : **[5]**

- i) Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be a linear transformation such that
 $T(1, 0, 0) = (2, 4, -1)$, $T(0, 1, 0) = (1, 3, -2)$, $T(0, 0, 1) = (0, -2, 2)$.
Compute $T(-2, 4, -1)$.
- ii) Find the standard matrix for the linear transformation $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by
 $T(x, y, z) = (5x - 3y + z, 2z + 4y, 5x + 3y)$



Total No. of Questions : 5]

SEAT No. :

PE1425

[Total No. of Pages : 2

[6501]-411

S.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCES

**EVS - 241 : Biological Diversity & Its Conservation
(2019 Credit Pattern) (Semester - IV) (Paper - I) (24241)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory*
- 2) *Solve any three questions from Question No. 2 to Question No. 5.*
- 3) *Question No. 2 to Question No. 5 carry equal marks.*

Q1) Answer any five of the following.

[5]

- a) Define Biodiversity conservation.
- b) What are land races?
- c) What is species diversity?
- d) Give two examples of global Biodiversity threats.
- e) What is the role of CITES in Biodiversity conservation.
- f) Define optional values of biodiversity?

Q2) a) Explain various methods of assessing Biological diversity.

[6]

b) Describe the factors affecting the global distribution of species richness.**[4]**

Q3) a) What are the major genetic diversity factors and their impact on evolution? **[6]**

b) Discuss the role of genetically modified organisms (GMO's) in biodiversity conservation. **[4]**

P.T.O.

- Q4)** a) Explain in-situ conservation methods with examples. [6]
- b) Describe the role of convention of Biological diversity (CBD) in Biodiversity conservation. [4]

Q5) Write short notes on any four of the following.

- a) Classification of Biodiversity levels. [2½]
- b) Measuring species diversity. [2½]
- c) Importance of biodiversity in ecosystem services. [2½]
- d) Human wildlife conflict and Biodiversity conservation. [2½]
- e) Role of IUCN in Bio diversity conservation. [2½]
- f) Contribution of biodiversity to commercial values. [2½]

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Total No. of Questions : 4]

SEAT No. :

PE-1426

[Total No. of Pages : 3

[6501]-412

S.Y. B.Sc.

MATHEMATICS

MT-242(A) : Vector Calculus

(2019 Pattern) (CBCS) (Semester - IV) (24112A)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any FIVE of the following :

[5]

- a) Evaluate $\lim_{t \rightarrow 0} [e^{-t} \cos t \bar{i} + e^{-t} \sin t \bar{j} + e^{-t} \bar{k}]$
- b) Find the unit tangent vector to the curve, $\bar{r}(t) = a \cos t \bar{i} + a \sin t \bar{j}$, at $t = \frac{\pi}{2}$
- c) Evaluate $\int_0^1 [t^3 \bar{i} + 7 \bar{j} + (t+1) \bar{k}] dt$
- d) Give parametric representation of the cone $z = \sqrt{x^2 + y^2}$, $0 \leq z \leq 1$.
- e) Find $\bar{k}$ - component of curl $\bar{F}$ for the vector field $\bar{F} = (x+y) \bar{i} + 2xy \bar{j}$ on the plane.
- f) Show that the vector field, $\bar{F} = x^2 y \bar{i} + (4z^3 y - xy^2) \bar{j} - z^4 \bar{k}$ is solenoidal.
- g) State the Divergence Theorem in Three dimensions.

Q2) a) Attempt any one of the following :

[5]

- i) If $\bar{r}(t)$ is a differentiable function of 't' and the length of $\bar{r}(t)$ is

constant then prove that $\bar{r} \cdot \frac{d\bar{r}}{dt} = 0$

P.T.O.

- ii) If $\vec{u}(t), \vec{v}(t)$ are differentiable vector functions then prove that

$$\frac{d}{dt}[\vec{u}(t) \times \vec{v}(t)] = \vec{u}(t) \times \frac{d}{dt}\vec{v}(t) + \frac{d}{dt}\vec{u}(t) \times \vec{v}(t)$$

- b) Attempt any one of the following : [5]

- i) Find the arclength of the curve,

$$\vec{r}(t) = 2\cos t \vec{i} + 2\sin t \vec{j} + \sqrt{5}t \vec{k}, \text{ from } t = 0 \text{ to } t = \pi.$$

- ii) Evaluate the line integral, $\int_C -ydx + zdy + zxdz$, where C is the

$$\text{helix, } \vec{r}(t) = \cos t \vec{i} + \sin t \vec{j} + t \vec{k}, 0 \leq t \leq 2\pi.$$

- Q3) a) Attempt any one of the following : [5]

- i) State Green's Theorem in plane in tangential form and use it to

evaluate $\oint_C (6y+x)dx + (y+2x)dy$, where C is the circle

$$(x-2)^2 + (y-3)^2 = 4$$

- ii) Let C be the smooth curve joining the point A to the point B in the plane and is parametrized by $\vec{r}(t)$. Let f be a differentiable function with a continuous gradient vector $\vec{F} = \nabla f$ on a domain

D containing C. Then prove that $\int_C \vec{F} \cdot d\vec{r} = f(B) - f(A)$

- b) Attempt any one of the following : [5]

- i) Discuss the continuity of the function

$$\vec{F}(t) = \begin{cases} \frac{(t^2-1)}{(t-1)} \vec{i} + t^3 \vec{j} + \left(\frac{t^3-1}{t-1} \right) \vec{k}, & \text{if } t \neq 1 \\ 2\vec{i} + \vec{j} + 3\vec{k}, & \text{if } t = 1 \end{cases}$$

- ii) Evaluate $\iint_S y d\sigma$ where S is the portion of cylinder $x^2 + y^2 = 3$ that lies between $z = 0$ and $z = 6$.

Q4) a) Attempt any one of the following : **[5]**

i) Define the curl of a vector field $\vec{F}$ and determine whether the field, $\vec{F} = \left(4y^2 + \frac{3x^2y}{z^2}\right)\vec{i} + \left(8xy + \frac{x^3}{z^2}\right)\vec{j} + \left(11 - \frac{2x^3y}{z^3}\right)\vec{k}$ is conservative.

ii) State Stoke's Theorem and evaluate $\iint_S \nabla \times \vec{F} \cdot \vec{n} \, ds$, for the vector field, $\vec{F} = z^2\vec{i} - 3xy\vec{j} + x^3y^3\vec{k}$ and S is part of $z = 5 - x^2 - y^2$ above plane $z = 1$. Assume that S is oriented upwards.

b) Attempt any one of the following : **[5]**

i) Find the flux of $\vec{F} = (x-y)\vec{i} + x\vec{j}$, across the circle $x^2 + y^2 = 1$ in the xy - plane.

ii) Evaluate $\iint_S 6xy \, ds$, where S is the portion of plane $x + y + z = 1$ that lies in the first octant and is in front of the yz - plane.



Total No. of Questions : 4]

SEAT No. :

PE1427

[Total No. of Pages : 2

[6501]-413

S.Y.B.Sc. (Regular)

MATHEMATICS

MT-242(B) : Dynamical Systems

(2019 Credit Pattern) (Semester - IV) (24112(B))

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.

Q1) Attempt any five of the following :

[5]

- a) Suppose matrix $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ is matrix A diagonalizable? Justify your answer.
- b) Define linearly independent and dependent vectors in the plane.
- c) Write the given second order differential equation as a system of first order differential equation $3x''(t) - 2x'(t) - 4x(t) = 0$.
- d) Find all equilibrium points of the system $x' = 3x + 2y, y' = 6x + 4y$.
- e) Without finding the eigenvalues of the matrix $A = \begin{bmatrix} 5 & -3 \\ -4 & -6 \end{bmatrix}$ determine the nature of the eigenvalues.
- f) If 4 and 5 are eigenvalues of matrix A, then what will be the eigenvalues of A^2 .
- g) Give an example of a system of differential eqⁿ for which (e^{2t}, e^{-t}) is a solution.

Q2) a) Attempt any one of the following.

[5]

- i) If A is $n \times n$ matrix which is diagonalizable then prove that A has n linearly independent vectors.
- ii) Matrix A is a non-zero matrix, then prove that a planar linear system $X' = AX$ has
 - 1) Unique equilibrium point $(0, 0)$ if $\det(A) \neq 0$.
 - 2) A straight line of equilibrium points if $\det(A) = 0$.

P.T.O.

b) Attempt any one of the following : [5]

i) Find the basis for the eigenspace of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.

ii) Show that the matrix A is not diagonalizable where $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ -3 & 5 & 2 \end{bmatrix}$.

Q3) a) Attempt any one of the following. [5]

i) Suppose that $\bar{V}_0$ is an eigenvector for the matrix A with associated eigenvalue λ , then prove that the function $X(t) = e^{\lambda t} V_0$ is a solution of the system $X' = AX$.

ii) Prove that the 2×2 matrix T is invertible if and only if $\det(T) \neq 0$.

b) Attempt any one of the following : [5]

i) Find the general solution of the system $X' = AX$, where

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} X.$$

ii) Find the general solution of $x' = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} X$ and sketch the phase portrait.

Q4) a) Attempt any one of the following : [5]

i) If A is 2×2 matrix with eigenvalues λ_1 and λ_2 then prove that trace of A is $\lambda_1 + \lambda_2$ and determinant of A is $\lambda_1 \cdot \lambda_2$.

ii) Show that $\frac{d}{dt}(\exp(tA)) = A \cdot \exp(tA)$
 $= \exp(tA) \cdot A$

b) Attempt any one of the following. [5]

i) Find the exponential form of the matrix A, where $A = \begin{bmatrix} 5 & -6 \\ 3 & -4 \end{bmatrix}$.

ii) Find the matrix T that puts the matrix A into canonical form, where

$$A = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix}.$$



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE1428

[6501]-414

S.Y. B.Sc. (Regular)

ENVIRONMENTAL SCIENCE

EVS-242 : Environmental Pollution Control Technology

(2019 Pattern) (Semester - IV) (24242)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from question No. 2 to question No. 5.*
- 3) *Question No. 2 Question No. 5 carry equal marks.*

Q1) Answer any five of the following : **[5]**

- a) What do you meant by stack? **[1]**
- b) Define the term leg in noise pollution. **[1]**
- c) What are objectives of tertiary wastewater treatment? **[1]**
- d) Give importance of phytoremediation in soil pollution control. **[1]**
- e) Name any two instrument used in air quality monitoring. **[1]**
- f) What is function of grit chamber in wastewater treatment. **[1]**

Q2) a) Describe in detail the plume behaviour. **[6]**

b) Describe key steps involve in wastewater treatment. **[4]**

Q3) a) Discuss the objectives and importance of water quality monitoring. **[6]**

b) Explain the role of microorganism in soil bioremediation. **[4]**

P.T.O.

- Q4)** a) Explain various parameters used in measurement of individual tree. [6]
- b) Discuss method which reduce dependency on various chemical in agriculture. [4]

Q5) Write short notes on any four of the following :

- a) Chain of custody [2½]
- b) Screening process [2½]
- c) Soil carbon flux [2½]
- d) National Air Quality Standards [2½]
- e) Handling & storage of soil sample [2½]
- f) PPE for Noise pollution [2½]



Total No. of Questions : 5]

SEAT No. :

PE1429

[Total No. of Pages : 4

[6501]-415

S.Y. B.A./B.Com./B.Sc.

AECC-III : ENVIRONMENTAL STUDIES / AWARENESS

(2019 Pattern) (Semester - IV) (24361)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from question No. 2 to question No. 5.
- 3) Question No. 2 to question No. 5 carry equal marks.

Q1) Answer any five of the following. **[5]**

- a) Give any Two control measures used to reduce air pollution.
- b) Name Two methods used in solid waste management.
- c) Name two factors that contributes formation of cyclones.
- d) Mention any two reason of ozone layer depletion.
- e) What do you meant by Environmental awarness.
- f) What is role of media in environmental awarness.

Q2) a) Discuss significant impacts of earthquake on Human life & environment. **[6]**

b) Define radiation pollution. Discuss impacts of nuclear radiations. **[4]**

Q3) a) Explain the causes, effects and control measures of noise pollution. **[6]**

b) Explain role of different environmental law's in environmental conservation. **[4]**

Q4) a) What is human wildlife conflict? Explain briefly any examples of Human-Wildlife conflict. **[6]**

b) What is population explosion? Discuss effects of rapid population growth of environment. **[4]**

P.T.O.

Q5) Write short notes on any four of the following.

[10]

- a) Types and causes of soil pollution.
- b) Urban solid waste management challenges.
- c) Role of tribal communities in conservation.
- d) Convention on Biological Diversity (CBD).
- e) Landslides: causes & prevention.
- f) Importance of public awareness of Environmental Education.



Total No. of Questions : 5]

PE1429

[6501]-415

S.Y. B.A./B.Com./B.Sc.

AECC-III : ENVIRONMENTAL STUDIES / AWARENESS

(2019 Pattern) (Semester - IV) (24361)

(मराठी रूपांतर)

वेळ : 2 तास]

[एकूण गुण : 35

सूचना :- 1) प्रश्न क्रं. 1 सोडविणे आवश्यक आहे.

2) प्रश्न क्रं. 2 ते प्रश्न क्रं. 5 यापैकी कोणतेही तीन प्रश्न सोडवा.

प्र.1) खालीलपैकी कोणत्याही पाच प्रश्नांचे उत्तरे लिहा.

[5]

- अ) वायुप्रदूषण कमी करण्यासाठी वापरल्या जाणाऱ्या कोणत्याही दोन नियंत्रण उपाययोजनांची नावे सांगा.
- ब) घणकचरा व्यवस्थापनात वापरल्या जाणाऱ्या कोणत्याही दोन पद्धती सांगा.
- क) चक्रीवादळ निर्मितीमध्ये योगदान देणारे दोन घटक कोणते.
- ड) ओझन थराच्या ज्हासाची दोन कारणे सांगा.
- इ) पर्यावरण जागृती म्हणजे काय?
- फ) पर्यावरणीय संवादामध्ये माध्यमांची काय भूमिका आहे?

प्र.2) अ) मानवी जीवन व पर्यावरणावर भूकंपाचे कोणते परिणाम होतात?

[6]

ब) किरणोत्सर्ग प्रदूषणाची व्याख्या सांगा. अण्विक किरणोत्सर्गामुळे होणाऱ्या परिणामांवर सविस्तर चर्चा करा.

[4]

प्र.3) अ) ध्वनीप्रदूषणाची कारणे, परिणाम आणि नियंत्रण उपाय स्पष्ट करा.

[6]

ब) पर्यावरण संवर्धनात पर्यावरणीय कायद्यांची भूमिका स्पष्ट करा.

[4]

प्र.4) अ) मानव वन्यजीव संघर्ष म्हणजे काय? मानव वन्यजीव संघर्षाच्या कोणत्याही उदाहरणांचे थोडक्यात स्पष्टीकरण द्या.

[6]

ब) लोकसंख्या विस्फोट म्हणजे काय? संख्या वाढीचे पर्यावरणावर काय परिणाम होतात?

[4]

प्र.5) खालीलपैकी कोणत्याही चारवर टिपा लिहा.

[10]

- अ) मृदा प्रदूषण प्रकार व कारणे
- ब) शहरी घनकचरा व्यवस्थापनातील आव्हाने
- क) संवर्धनात आदीवासी समुदायांची भूमिका
- ड) जैवविविधता अधिवेशन
- इ) भूस्खलन: कारणे व प्रतिबंध
- फ) सार्वजनिक जागरूकता व पर्यावरण शिक्षण



Total No. of Questions : 5]

SEAT No. :

PE-1430

[Total No. of Pages : 2

[6501]-416

S Y. B.Sc.

ZOOLOGY

ZO-242 : Applied Zoology - II

(2019 Pattern) (CBCS) (Semester - IV) (Paper - II) (24152)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q. 1 is compulsory.
- 2) Solve any three questions from Q. 2 to Q. 5.
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any five of the following :

[5]

- a) Define Apiary.
- b) Define fresh water fisheries.
- c) What is Absconding?
- d) Define Gear.
- e) What is Nuptial flight?
- f) Give biological name of western bee.

Q2) a) Explain division of labour in honey bee.

[6]

OR

Describe habit, habitat and culture method of catla catla.

- b) Explain Wag-tail dance in honey bee.

[4]

P.T.O.

Q3) a) Describe harvesting method of Mackerel and Harpodon. **[6]**

OR

Describe Langstroth bee box.

b) Describe winter season management in bee keeping. **[4]**

Q4) a) Describe catamaran and cast net. **[6]**

OR

Give uses of bee wax and royal jelly.

b) Describe canning fish preservation technique. **[4]**

Q5) Write short notes on any four of the following : [10]

- a) Fish manure
- b) Habit and habitat of *Apis dorsata*.
- c) Drying as fish preservation technique.
- d) Bee pollination
- e) Brackish water fisheries
- f) Swarming



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE1431

[6501]-417

S.Y.B.Sc. (Regular)

ZOOLOGY

ZO-241 : Animal Diversity - IV

(2019 Pattern) (Semester - IV) (CBCS) (24151)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Solve any five of the following : **[5]**

- a) Write any one habit of rat.
- b) Give any one salient feature of class reptilia.
- c) Write any two digestive glands of rat.
- d) Write any two examples of class Mammalia.
- e) Give any one example of wood chiselling beak.
- f) Give any one example of cursorial feet.

Q2) a) Describe the female reproductive system of rat. **[6]**

OR

Describe desert adaptations in reptiles.

b) Describe the salient features of class Aves. **[4]**

Q3) a) Describe Fossorial adaptations in mammals. **[6]**

OR

Describe the alimentary canal of rat.

b) Describe in brief the respiratory system of rat. **[4]**

P.T.O.

Q4) a) Sketch and label v.s. of eye of rat. **[6]**

OR

Sketch and label internal structure of heart of rat.

b) Describe altitudinal and latitudinal migration in birds. **[4]**

Q5) Write short notes on any four of the following : **[10]**

- a) Structure of internal ear in rat
- b) Sexual dimorphism in rat
- c) Functions of brain in rat
- d) Viper snake
- e) Food and feeding in rat
- f) Duck billed platypus



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE1432

[6501]-418

S.Y.B.Sc. (Regular)

BOTANY - I

**BO-241 : Plant Anatomy and Embryology
(2019 Pattern) (Semester - IV) (CBCS) (24141)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt any five of the following :

[5]

- a) Define Anatomy.
- b) What are motor cells?
- c) What is vascular tissue system?
- d) Define plant embryology.
- e) What is unitegmic ovule?
- f) What is pollination?

Q2) a) Explain the process of anomalous secondary growth in dicot stem. **[6]**

b) Describe monosporic embryo sac. **[4]**

Q3) a) Explain the structure and function of male gametophyte. **[6]**

b) Describe the process of normal secondary growth in dicot stem. **[4]**

P.T.O.

Q4) a) Explain the structure of typical dicot and monocot stomata. **[6]**

b) Describe the process of germination of pollen grains. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Incompressibility

b) Scope of plant anatomy in taxonomy

c) Cellular endosperm

d) Orthotropous ovule

e) Dicot embryo

f) Chalazogamy



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE1433

[6501]-419

S.Y.B.Sc. (Regular)

BOTANY

BO-242 : Plant Biotechnology

(2019 Pattern) (CBCS) (Semester-IV) (Paper-II) (24142)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.No. 2 to 5.*
- 3) *Question No. 2 to 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagram wherever necessary.*

Q1) Attempt any five of the following. **[5]**

- a) Define plant tissue culture.
- b) What is transgenic plant?
- c) Write any two non-renewable energy sources.
- d) Define genetic engineering.
- e) Write two sources of SCP.
- f) What is bioremediation?

Q2) a) Describe concept of genomics and add a note on its types. **[6]**

b) Explain cultivation of Spirulina. **[4]**

Q3) a) Describe various methods of Sterilization. **[6]**

b) Explain concept of bioethanol. **[4]**

Q4) a) Describe restriction enzymes and write its applications. **[6]**

b) Explain steps of nutrient media preparation. **[4]**

P.T.O.

Q5) Write short notes on any four of the following.

[10]

- a) Importance of plant biotechnology.
- b) Plasmid
- c) Micropropagation
- d) Importance of protein in diet
- e) Bioinformatics
- f) Phytoremediation



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

PE1434

[6501]-420

S.Y.B.Sc. (Regular)

GEOLOGY

**GL 221 Global Tectonics and Geodynamics of the Lithosphere
(2019 Pattern) (Semester-IV) (Paper-II) (24161)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question no. 1 is compulsory.*
- 2) *Solve any Three questions from Question 2 to Question 5.*
- 3) *Question No. 2 to 5 carry equal marks.*

Q1) Answer the following questions in 2-3 line (Any five) one mark each. **[5]**

- a) What is M.O.R.?
- b) What is Isostasy?
- c) What is Asthenosphere?
- d) Enlist type of plate boundaries.
- e) What is meant by mobile belt?
- f) What are magnetic anomalies?

Q2) Answer the following.

- a) Explain physical properties of crust and mantle. **[6]**
- b) Give morphology of ocean floor **[4]**

Q3) Answer the following.

- a) Define Isostasy. Explain isostatic equilibrium. **[6]**
- b) Explain shield and platform. **[4]**

P.T.O.

Q4) Answer the following

- a) Explain asthenosphere-lithosphere interaction. [6]
- b) Explain structure of oceanic crust. [4]

Q5) Write short notes on any Four (2.5 marks each) [10]

- a) Plate boundaries
- b) Geotherms
- c) Wilson's cycle
- d) Mesosphere
- e) Craton
- f) Mobile belt



Total No. of Questions :4]

SEAT No. :

PE1435

[Total No. of Pages : 3

[6501]-421

S.Y.B.Sc. (Regular)

STATISTICS

ST-241: Tests of Significance and Statistical Methods

(2019 Pattern) (Semester-IV) (Paper-I) (24171)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of Statistical tables and calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following:

A) In each of the following cases, choose the correct alternative: [1 each]

- a) Type I error is
 - i) Accepting H_0 when it is true
 - ii) Rejecting H_0 when it is true
 - iii) Accepting H_0 when it is false
 - iv) Rejecting H_0 when it is false
- b) The multiple correlation coefficient lies between
 - i) 0 to 1
 - ii) -1 to 1
 - iii) 0 to ∞
 - iv) $-\infty$ to ∞
- c) The ratio of Crude Birth Rate to Crude Death Rate is
 - i) Pearl's vital index
 - ii) Crude rate of natural increase
 - iii) Net Reproduction Rate
 - iv) Gross Reproduction Rate

B) In each of the following, state whether the given statement is true or false:

[1 each]

- a) $R_{1.23}$ is the maximum correlation between X_1 and the linear combination of X_2 and X_3 .
- b) If $NRR < 1$ then there is increase in population.

P.T.O.

Q2) Attempt any two of the following.

[5 each]

- a) Define the terms:
 - i) Parameter
 - ii) Statistic
 - iii) Level of significance
 - iv) Test statistics
 - v) Critical region
- b) Derive the formula for multiple correlation coefficient of X_1 on X_2 and X_3 . (i.e. $R_{1.23}$) in terms of total correlation coefficient.
- c) Customers arrive at a box office window being served by a single person according to Poisson process with a mean rate of 60 per hour. The time required to server a customer has an exponential distribution with a mean of 40 seconds. Determine
 - i) Utilization ratio of this service system.
 - ii) Average length of queue.
 - iii) Average length of system.

Q3) Attempt any two of the following.

[5 each]

- a) Explain Gross Reproduction Rate and Net Reproduction Rate with interpretations.
- b) Define the term residual and it's order, derive the expression $\sigma_{1.23}^2$.
- c) Explain how to construct a $100(1-\alpha)\%$ confidence interval for population mean (μ) of normal distribution when standard deviation (σ) is known, while testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$

Q4) Attempt any one of the following. [3]

- a) i) Define C.D.R. & A.S.D.R.
ii) A random sample of 200 bolts manufactured by machine A and 100 bolts manufactured by machine B showed 19 and 5 are defective bolts respectively. Is Machine B better than machine A? Use 5% level of significance. [7]
- b) i) Calculate G.F.R., A.S.F.R., and T.F.R., for the following data. [5]

Age-group	Number of women	Number of births
15-25	1000	15
25-35	2000	200
35-45	1000	100
45-55	500	40

- ii) Describe the test procedure to test $H_0 : P = P_0$ versus $H_1 : P \neq P_0$ [5]



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

PE1436

[6501]-422

S.Y.B.Sc. (Regular)

PSYCHOLOGY

Health Psychology

(2019 Pattern) (Semester-IV) (24201) (Paper-I)

Time : 2 Hours]

[Max. Marks :35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions from 2 to 5 carry equal marks.*

Q1) Solve any five of the following

[5]

- a) What is coping?
- b) Define stress.
- c) Define Health Psychology.
- d) State the importance of exercise
- e) Define resilience.
- f) What is health behaviour?

Q2) a) What are the effects of stress on physical and mental health?

OR

Classify the human strengths and virtues.

[6]

b) Examine the various components of health.

[4]

Q3) a) Describe the biopsychosocial model of health.

[6]

OR

How to cultivate Inner strengths by hope & optimism?

b) Explain the relationship of happiness and life satisfaction with health. **[4]**

P.T.O.

Q4) a) Describe the causes, Process and treatment of cancer as a chronic Illness. **[6]**

OR

Explain REBI as a appraisal focused coping Pattern.

b) Prioritize the various barriers of health behaviour. **[4]**

Q5) Write short notes on any of the following (Any four). **[10]**

- a) Chronic Illness
- b) Nutrition and health
- c) Holistic Health
- d) Characteristics of Health Behaviour
- e) Well Being
- f) Nature of coping



Total No. of Questions : 5]

SEAT No. :

PE1437

[Total No. of Pages : 2

[6501]-423

S.Y. B.Sc. (Regular)

GEOLOGY

**GL - 222 : Environmental Geology and Geogenic Disasters
(2019 Pattern) (Revised) (Semester - IV) (Paper - II) (24162)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Question No. 2 to Question No. 5.
- 3) Questions No. 2 to 5 carry equal marks.

Q1) Answer the following question in 2-3 line (any 5) [5]

- a) Define Physical environment.
- b) What is meant by bio-geochemical cycles?
- c) Define natural hazards.
- d) Define meteorological drought.
- e) What is Richter scale?
- f) Define flood.

Q2) Answer the following :

- a) What is hazard zonation map? Explain significance of Geology in disaster management plan for Earthquakes. [6]
- b) Explain surface and sub-surface water resources. [4]

Q3) Answer the following :

- a) Explain technological approaches. Explain land-use planning approaches to avoid flood damage. [6]
- b) Explain in detail organic pollutants. [4]

P.T.O.

Q4) Answer the following :

- a) What is meant by droughts? Explain different types of droughts and mitigation measures. [6]
- b) What are water quality parameters? Explain B.I.S. Standards. [4]

Q5) Write notes on any five of the following : [10]

- a) Building code
- b) Arsenic poisoning
- c) Water quality parameters
- d) Heavy metal pollution
- e) Natural Hazard Zones
- f) Impact assessment evolution

x x x

Total No. of Questions : 4]

SEAT No. :

PE1438

[Total No. of Pages : 2

[6501]-424

S.Y. B.Sc. (Regular)

STATISTICS

ST - 242 : Sampling Distribution and Exact Tests
(2019 Pattern) (CBCS) (Semester - IV) (Paper - II) (24172)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator and statistical table is allowed.
- 4) Symbols and Abbreviations have their usual meaning.

Q1) Attempt each of the following :

A) Choose the correct alternative in each of the following : [1 each]

a) Let $X \rightarrow F(4, 4)$ then median of X is

- | | |
|--------|-------|
| i) 4 | ii) 3 |
| iii) 2 | iv) 1 |

b) Let X_1, X_2, X_3 be i.i.d. $N(0, 1)$ variates and $Y = \frac{\sqrt{2} X_3}{\sqrt{X_1^2 + X_2^2}}$ then

$E(Y)$ is

- | | |
|---------------|-------|
| i) $\sqrt{2}$ | ii) 2 |
| iii) 0 | iv) 1 |

c) Let $X \rightarrow \chi_n^2$ and variance of X is 12 then value of n is

- | | |
|---------|--------|
| i) 24 | ii) 6 |
| iii) 12 | iv) 18 |

B) State whether each of the following statement is True or False : [1 each]

a) The p.d.f. of $G\left(\frac{1}{2}, \frac{1}{2}\right)$ is same as that of χ^2 distribution with 10 degrees of freedom.

b) Let $X \rightarrow F_{4,10}$, $Y \rightarrow F_{6,10}$ then $E(X) = E(Y)$.

P.T.O.

Q2) Attempt any two of the following :

[5 each]

- a) Let $X \rightarrow \text{Gamma}(\alpha, \lambda)$ then $Y = CX \rightarrow G\left(\frac{\alpha}{C}, \lambda\right)$, where C is a constant.
- b) Show that the moments of odd order of t-distribution are zero.
- c) Test whether the following sample can be regarded as a sample drawn from normal population with variance 4. (Use 5% level of significance).
7.95, 4.90, 3.65, 7.07, 4.60.

Q3) Attempt any two of the following :

[5 each]

- a) Let $X_1, X_2, \dots, X_{10}$ be independent normal variates such that $E(X_i) = 0$ and $\text{Var}(X_i) = i^2$. Find $P\left[X_1^2 + \frac{X_2^2}{2^2} + \frac{X_3^2}{3^2} + \dots + \frac{X_{10}^2}{10^2} \geq 7.267\right]$.
- b) Find mode of Gamma distribution with parameters α and λ .
- c) Let $F \rightarrow F_{n,n}$, Show that the first and third quartiles are reciprocals of each other.

Q4) Attempt any one of the following :

- a) i) Explain paired t-test in detail. Give one real life situation where this test can be applied. **[5]**
- ii) Derive the p.d.f. of t-distribution with n degrees of freedom. **[5]**
- b) i) Show that if X and Y are independent χ^2 variates with m and n degrees of freedom respectively then $X + Y$ and $\frac{X}{X+Y}$ are independently distributed. **[5]**
- ii) Let $X \rightarrow t_8$. Find 'a' and 'b' such that $P(X^2 \leq a) = 0.01$ and $P(X^2 \geq b) = 0.01$. **[5]**

x x x

Total No. of Questions : 5]

SEAT No. :

PE1439

[Total No. of Pages : 2

[6501]-425

S.Y. B.Sc. (Regular)

PSYCHOLOGY

Psychological Testing and Application

(2019 Pattern) (Semester - IV) (Paper - II) (24202)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three from Q.2 to Q.5.*
- 3) *Questions from 2 to 5 carry equal marks.*

Q1) Solve any five of the following : **[5]**

- a) Define personality.
- b) What is neuropsychology?
- c) Define Aptitude.
- d) Define adjustment.
- e) Define personality traits.
- f) What is projective technique?

Q2) a) Explain any two psychological test used for assessment of abnormal behaviour and mental disorder. **[6]**

OR

How MMPI is used as a personality assessment tool?

b) Analyze the concepts in intelligence testing. **[4]**

Q3) a) Describe any two test which assess the family adjustment with their psychometric properties. **[6]**

OR

Explain the light subscales of DAT with their psychometric properties.

b) Examine the various aspects of adjustment & value. **[4]**

P.T.O.

Q4) a) Illustrate any two types of projective tests. **[6]**

OR

Describe any one type of intelligence test with their psychometric properties.

b) What are the goals of a neuropsychological assessment? **[4]**

Q5) Write short notes on any four of the following : **[10]**

- a) Work motivation scale
- b) Component of mental health
- c) BDI
- d) Marital adjustment scale
- e) GATB
- f) Value tests

x x x

Total No. of Questions : 4]

SEAT No. :

PE1440

[Total No. of Pages : 1

[6501]-426

S.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS-401 : International Security

(2019 Pattern) (Semester - IV) (24231)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Define the following questions. **[5]**

- a) Define State.
- b) What is International Law?
- c) Define National Security.
- d) What is Nationalism?
- e) What is Common Security?

Q2) Write short notes on (any two) **[10]**

- a) Balance of Power (BOP).
- b) Non-Alignment.
- c) National Power.

Q3) Attempt the following questions (any two) **[10]**

- a) State the Concept of Nationalism.
- b) State the Importance of International Law.
- c) Explain the Significance of Disarmament.

Q4) Answer in details (any one) **[10]**

- a) Explain in detail International Law role in maintaining World Peace and Security.
- b) Describe the Impact on National Interest and Protection of Core values.

x x x

Total No. of Questions : 5]

SEAT No. :

PE1441

[Total No. of Pages : 2

[6501]-427

S.Y. B.Sc. (Regular)

MICROBIOLOGY

MB - 241 : Bacterial Genetics

(2019 Pattern) (CBCS) (Semester - IV) (24191)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions from 2 to 5 carry equal marks.*

Q1) Solve any five of the following : **[5]**

- a) Define plasmid.
- b) _____ is a left-handed helix.
- c) Describe the role of single stranded binding proteins in replication.
- d) Which enzyme catalyses the process of transcription?
- e) _____ is the removal of an amino acid group from a base.
- f) Explain the role of helicase in replication.

Q2) a) Describe the following any two : **[6]**

- i) Describe the different forms of DNA.
- ii) Describe the properties of genetic code.
- iii) Describe rolling circle mechanism of replications.
- b) Diagrammatically describe the Rho-dependant termination of transcription.**[4]**

Q3) a) Explain the following any two : **[6]**

- i) Explain the process of plasmid curing.
- ii) Explain Griffith's transformation experiment.
- iii) Explain the role of topoisomerases in replication.
- b) Write in brief about the three modes - conservative, semi-conservative and dispersive replication. **[4]**

P.T.O.

- Q4)** a) Discuss the following any two : **[6]**
- i) Discuss the outcomes of Hershey and Chase experiment.
 - ii) Discuss the mechanism of action of intercalating agents in replication.
 - iii) Discuss the role of promoter in transcription.
- b) With neat labelled diagram explain the structure of RNA. **[4]**

Q5) Write short notes on any four of the following : **[10]**

- a) Plasmid incompatibility
- b) Point mutation
- c) Pyrimidine bases
- d) Origin of replication
- e) Induced mutations
- f) Depurination

x x x

Total No. of Questions : 4]

SEAT No. :

PE1442

[Total No. of Pages : 1

[6501]-428

S.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS-402 : Defence Economics

(2019 Pattern) (Semester - IV) (24232)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Define the following questions. **[5]**

- a) Write full form of DRDO.
- b) Define Budget.
- c) Define the Central budget.
- d) Write types of budget.
- e) Define Security.

Q2) Write short notes on (any two) **[10]**

- a) HAL.
- b) DPSU.
- c) Defence budget.

Q3) Attempt the following questions (any two) **[10]**

- a) Explain the Parliamentary Budget of India.
- b) Describe the Basic Concepts of Planning of Defence Budget.
- c) Explain the role of the DPSUs and Private Sector in Indian Defence production.

Q4) Answer in details (any one) **[10]**

- a) Explain in detail the Defence Vs Development.
- b) Explain in detail the Nature and Scope of Defence Management.

x x x

Total No. of Questions : 5]

SEAT No. :

PE1443

[Total No. of Pages : 2

[6501]-429

S.Y. B.Sc. (Regular)

MICROBIOLOGY

**MB - 242 : Air, Water and Soil Microbiology
(2019 Pattern) (CBCS) (Semester - IV) (24192)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of the following : [5]

- a) What are droplet nuclei?
- b) Give any two examples of coliforms.
- c) Define MPN test.
- d) State the difference between distilled water and de-mineralized water.
- e) CPCB stands for _____.
- f) Give examples of any two algal biofertilizers.

Q2) a) Describe the following any two : [6]

- i) Describe the different Physical methods of air sanitation.
- ii) Describe the characteristics of faecal indicators of pollution.
- iii) Describe the significance of biological nitrogen fixation with suitable example.

b) Describe in brief parasitism and predation. [4]

Q3) a) Explain the following any two : [6]

- i) Explain the principle of centrifugation used in air sampling.
- ii) Explain the purpose of completed test for water analysis.
- iii) Explain the phenomenon of neutralism with appropriate examples.

b) Write in detail the role of micro organisms in carbon cycle. [4]

P.T.O

- Q4)** a) Discuss the following any two : **[6]**
- i) Discuss the applications of composting.
 - ii) Discuss the different functions of MPCB.
 - iii) Discuss the advantages and limitations of biofertilizers.
- b) Discuss the role of micro organisms in humus formation. **[4]**

Q5) Write short notes on any four of the following : **[10]**

- a) Sedimentation
- b) Role of Bureau of Indian standards
- c) Confirmed test
- d) Rhizosphere microflora
- e) Ammensalism
- f) Ventilation

x x x

Total No. of Questions : 4]

SEAT No. :

PE1444

[Total No. of Pages : 1

[6501]-430

S.Y. B.Sc. (Regular)

DEFENCE AND STRATEGIC STUDIES

DS-403 : Defence Journalism

(2019 Pattern) (Semester - IV) (24233) (Credit System)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Define the following questions.

[5×1=5]

- a) What is Media?
- b) Define Journalism.
- c) Define Conflict Management.
- d) Define Security.
- e) Define Defence Journalism.

Q2) Write short notes on (any two)

[10]

- a) Laws and Role of Media.
- b) Defence Journalism.
- c) Defence & Media.

Q3) Attempt the following questions (any two)

[10]

- a) Explain the Duties and Responsibilities Defence Journalist.
- b) State the Current Trends in Defence Journalism.
- c) Explain the Role of Defence Journalism in International Security Studies.

Q4) Answer in details (any one)

[10]

- a) Discuss in detail the Problems, Prospects and Limitations faced by the Defence Journalists.
- b) Discuss in detail the Role of Defence Journalism in National Security Studies.

x x x

Total No. of Questions : 5]

SEAT No. :

PE1445

[Total No. of Pages : 2

[6501]-431

S.Y. B.Sc. (Regular)

ELECTRONIC SCIENCE

EL - 241 : Analog Circuit Design

(CBCS 2019 Pattern) (Semester - IV) (Paper - I) (24221)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : [5]

- a) What is mean by an Oscillator?
- b) What is conversion efficiency of class A amplifier with Resistive load?
- c) Define Bandwidth of an amplifier.
- d) Comment "The efficiency of class B amplifier is greater than class A amplifier".
- e) Define thermal runaway.
- f) What is bode plot?

Q2) Answer the following :

- a) i) What are the different types of feedback? [2]
ii) Explain the concept of Negative feedback [4]
- b) Determine the frequency of wein bridge oscillator for $R_1 = R_2 = 5 \text{ k}\Omega$ & $C = 0.01 \text{ }\mu\text{F}$. [4]

Q3) Answer the following :

- a) i) What is mean by small signal amplifier. [2]
ii) Calculate the conversion efficiency of class A amplifier. [4]
- b) Draw and explain function generator circuit using OP-AMP. [4]

P.T.O.

Q4) Answer the following :

- a) i) Which factor should be considered while selecting PA system. [2]
- ii) Draw and explain Adder circuit using OP-AMP. [4]
- b) For RC phase shift oscillator $R_1 = R_2 = R_3 = 10k\Omega$ and $C_1 = C_2 = C_3 = 0.01 \mu F$. [4]

Q5) Attempt any four of the following : [10]

- a) What are the applications of Integrator?
- b) Write a note on cross over distortion.
- c) What is mean by Multistage Amplifier?
- d) Write a note on DC load line.
- e) Give the difference between voltage amplifier and power amplifier.
- f) What are advantages of Negative feedback?

x x x

Total No. of Questions : 5]

SEAT No. :

PE1446

[Total No. of Pages : 2

[6501]-432

S.Y. B.Sc. (Regular)

ELECTRONIC SCIENCE

**EL - 242 : Microcontroller and Python Programming
(2019 Credit Pattern) (Semester - IV) (Paper - II) (24222)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of the following :

[5×1=5]

- a) What is Arduino?
- b) What is the difference between analog and digital pins of Arduino?
- c) List any two advantages of function.
- d) Define variable.
- e) What is Python?
- f) What is the use of break statement in python?

Q2) a) Answer the following :

- i) Write the structure of Arduino Program. **[2]**
- ii) Explain in detail arithmetic and logical operators of Arduino. **[4]**
- b) Write the use of analog and digital functions in Arduino with syntax. **[4]**

Q3) a) Answer the following :

- i) What is a 'list' in Python? **[2]**
- ii) Write a python program to find given number is even or odd. **[4]**
- b) Describe syntax of 'While' loop and give any example for it. **[4]**

P.T.O.

Q4) a) Answer the following :

- i) What is module in python? [2]
- ii) Explain global and local variables in Python. [4]
- b) Write a note on building blocks of programs in python. [4]

Q5) Answer any four of the following : [10]

- a) Write a program in Arduino to blink LED continuously.
- b) Write a python program to add two numbers read using int and input functions.
- c) Write any five features of Arduino Uno board.
- d) What is microcontroller? Which microcontroller is used in Arduino Uno?
- e) What is PWM? What is the use of PWM in Arduino?
- f) List Python data types. Explain any one in detail.

x x x

Total No. of Questions : 5]

SEAT No. :

PE-1447

[Total No. of Pages : 3

[6501]-433

S.Y.B.Sc.

GEOGRAPHY

Gg-241 : Environmental Geography - II

(2019 Pattern) (CBCS) (Semester - IV) (Paper - I) (24181)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q. 1 is compulsory.
- 2) Solve any three questions from Q. 2 to Q. 5.
- 3) Questions 2 to 5 carry equal marks.
- 4) Use of map stencil is allowed.

Q1) Answer the following questions in 20 words. (Any Five) :

[5]

- a) Write the names of major programme for environmental protection and conservation in India.
- b) Write any two major environmental laws in India.
- c) Write full form of UNEP.
- d) What is solid waste management?
- e) What is mean by deforestation?
- f) What do you mean by Environment Impact Assessment?

P.T.O.

Q2) a) Answer the following questions in 100 words. (Any Two) : [6]

- i) Write principles of environmental planning, management and protection.
- ii) Describe various methods of water conservation.
- iii) Describe sustainable development Summit, New york - 2015

b) Answer the following question in 150 words. (Any One) : [4]

- i) Write amendments of forest conservation act-1980.
- ii) Discuss the difference between adhoc and delphi methods of EIA.

Q3) a) Answer the following questions in 100 words. (Any Two) : [6]

- i) Describe the steps in environment impact assessment.
- ii) Write the need and importance of to study the environmental conservation.
- iii) Explain the various activities of Tiger conservation in India.

b) Answer the following question in 150 words. (Any One) : [4]

- i) Write the need of environmental planning and management.
- ii) Describe the importance of water conservation with respect to Ganga action plan.

Q4) a) Answer the following questions in 100 words. (Any Two) : [6]

- i) Describe the role of NGO in environmental conservation.
- ii) Explain any two environmental policies in developing countries.
- iii) Write the need and importance of study the environmental geography.

b) Answer the following question in 150 words. (Any One) : [4]

- i) Explain Environmental Protection Act-1986.
- ii) Describe the scope of Environment Impact Assessment.

Q5) Write short notes on the following (Any Four) :

[10]

- a) 33 crore tree plantation programme in Maharashtra.
- b) Stockholm conference - 1972
- c) Energy conservation
- d) Approaches of environmental management.
- e) World Summit on sustainable development. Johannesburg - 2002.
- f) Need of environment impact assessment.



Total No. of Questions : 5]

SEAT No. :

PE1448

[6501]-434

[Total No. of Pages : 2

S.Y.B.Sc. (Regular)

NANOSCIENCES AND NANOTECHNOLOGY

**NS-241 : Organic and Polymer Science of Nanomaterials
(2019 Pattern) (Semester - IV) (Paper - I) (24261) (Credit System)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.*
- 2) Solve any 3 questions from Q.2 to Q.5.*
- 3) Draw the neat and labelled diagram wherever necessary.*
- 4) Figures to the right indicate full marks.*

Q1) Answer any five of the following.

[5×1=5]

- a) Define Average number Molecular weight?
- b) What is thermoplastic polymer?
- c) Give the two types of carbon nanotubes.
- d) Give the two Application of fire retardant polymerisation.
- e) Give the example of Biopolymers.
- f) Give the types of Nanocomposites.

Q2) a) Explain in detail Bio-degradable polymer.

[6]

OR

Give the salient features of different polymerisation techniques.

b) Explain in detail Anionic Polymerisation.

[4]

Q3) a) What is Nanocomposite? Explain in detail types of nanocomposites.**[6]**

OR

Explain in detail Reduced graphene oxide.

b) Explain in detail solution mixing and Insitu polymerisation.

[4]

P.T.O.

Q4) a) Explain in detail Liquid crystalline polymer. **[6]**

OR

Explain in detail synthesis of carbon Nanotubes in gaseous carbon sources Based technique.

b) Explain in detail synthesis of conducting polymer. **[4]**

Q5) Write short notes on any FOUR of the following. [10]

- a) Bulk polymerisation method.
- b) Electrochemical polymerisation.
- c) Interfacial condensation.
- d) Nanofillers.
- e) Carbon nanotubes.
- f) Catalyst free Growth.



Total No. of Questions : 5]

SEAT No. :

PE-1449

[Total No. of Pages : 2

[6501]-435

S.Y. B.Sc. (Regular)

GEOGRAPHY - II

GG-242 : Geography of Maharashtra (Human - II)
(2019 Pattern) (Semester - IV) (CBCS) (24182) (Paper - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q. 1 is compulsory.
- 2) Attempt any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.
- 4) Use of map stencil is allowed.

Q1) Answer the following questions in 20 words (any Five) : **[5]**

- a) Enlist any Two religions in Maharashtra.
- b) Write any Two names of Express Highway.
- c) Write types of Migration.
- d) Enlist Two modes of transporation.
- e) Which district is core of production of Grapes in Maharashtra.
- f) Write Two names of MIDC in Maharashtra.

Q2) a) Answer the following questions in 100 words (Any 2) : **[6]**

- i) Write Geographical requirement of Wheat crop.
- ii) Give causes of rural to urban migration.
- iii) Explain the problems of Wine industry.

b) Answer the following questions in 150 words (Any 1) : **[4]**

- i) Explain the role of cash crop in agricultural development of Maharashtra.
- ii) Discuss the role of Air transport in transportation.

P.T.O.

- Q3) a)** Answer the following questions in 100 words (Any Two) : [6]
- i) Discuss the development of Metro in Maharashtra.
 - ii) Give the distribution of Sugarcane in Maharashtra.
 - iii) Describe migration in Maharashtra.
- b)** Answer the following questions in 100 words (Any One) : [4]
- i) Explain the importance of water transportation.
 - ii) Give an account of major industries in Maharashtra.
- Q4) a)** Answer the following questions in 100 words (Any 2) : [6]
- i) Discuss the role of MIDC in economic development of Maharashtra.
 - ii) Give the characteristics of population distribution in Maharashtra.
 - iii) Write the importance of road transport in Maharashtra.
- b)** Answer the following questions in 150 words (Any One) : [4]
- i) Explain the future of Sugarcane industries in Maharashtra.
 - ii) Which are the problems of IT industries in Maharashtra.
- Q5) Write short notes on the following (Any 4) :** [10]
- a) Prospects of Agriculture in Maharashtra.
 - b) Incoming migration in Maharashtra.
 - c) Communication in Maharashtra.
 - d) Wine Industry.
 - e) Rail transport.
 - f) Rice crop.



Total No. of Questions : 5]

SEAT No. :

PE-1450

[Total No. of Pages : 2

[6501]-436

S.Y. B.Sc.

(NANO SCIENCE AND NANOTECHNOLOGY)
NS-242 : ADVANCED TECHNIQUES FOR
CHARACTERIZATION OF NANOMATERIALS
(2019 Pattern) (Semester - IV) (Paper - II) (24262)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat & labeled diagram wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any FIVE of the following :

[5]

- a) Define dimpling process.
- b) What is bright field images?
- c) What is the principle of SEM?
- d) What is the use of exciter filter in fluorescence microscopy?
- e) What is RF SQUIDS?
- f) What is mean by Josephson junction?

Q2) a) Attempt any ONE of the following :

[6]

- i) With neat labeled diagram explain vibrating sample magnetometer.
- ii) With neat labeled diagram explain FESEM.

b) Explain HRTEM in brief with neat diagram.

[4]

P.T.O.

Q3) a) Attempt any ONE of the following : [6]

- i) What is the principle of EDAX? Also explain EDAX in brief.
- ii) With proper diagram explain confocal microscope.

b) Explain DSC analysis technique in brief. [4]

Q4) a) Attempt any ONE of the following : [6]

- i) Draw neat labeled diagram of fluorescence microscope & give it's advantages.
- ii) Explain biological sample preparation method for SEM.

b) Give the difference between SEM&TEM. [4]

Q5) Write short notes on any FOUR of the following : [10]

- a) Electron - matter interaction.
- b) Selected Area Electron Diffraction (SAED)
- c) Applications of DSC technique.
- d) Sample preparation for the SEM.
- e) Dark field images of TEM.
- f) Applications of EDAX.



Total No. of Questions : 5]

SEAT No. :

PE1451

[6501]-437

[Total No. of Pages : 2

S.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

VBT-221 : Genetic Engineering

(2019 Pattern) (CBCS) (Semester - IV) (24571) (Paper - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5 .*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of the following. [5]

- a) Define clone.
- b) Name the selectable markers of BAC vector.
- c) Give the full form of RT-PCR.
- d) Define shuttle vector.
- e) Name any one automated DNA sequencing method.
- f) On what basis do proteins get separated in SDS-PAGE?

Q2) a) Answer any two of the following. [6]

- i) Give any three characteristics of an ideal vector.
 - ii) Describe any one application of r-DNA technology in industry.
 - iii) What is meant by “Chain termination”? What is the role of dideoxyribonucleotide in Sanger’s method of DNA sequencing?
- b) Describe the transformation of bacterial cells by using calcium chloride treatment. [4]

OR

Explain the role of DNA ligases in r-DNA technology.

P.T.O.

- Q3) a)** Answer any one of the following. **[6]**
- i) Explain YAC vector in detail.
 - ii) Describe the basic steps involved in gene cloning.
 - iii) Explain Maxam Gilbert method of DNA sequencing in detail.
- b)** Explain the procedure of Southern blotting. **[4]**

OR

Write a short note on “Nomenclature of restriction enzymes”.

- Q4) a)** Answer any two of the following. **[6]**
- i) Define nucleases. Give any two differences between endonucleases and exonucleases.
 - ii) Distinguish between λ –insertion and λ –replacement vectors.
 - iii) Explain the steps involved in synthesis of recombinant insulin.
- b)** Explain any one non-radioactive labelling method in detail. **[4]**

OR

Describe the basic steps involved in PCR.

- Q5)** Write short notes on any four of the following. **[10]**
- a) Role of Taq polymerase in PCR.
 - b) Differences between expression vector and cloning vector.
 - c) Role of APS and luciferase in pyrosequencing method.
 - d) Applications of Western blotting.
 - e) Cry protein.
 - f) Blunt end DNA fragments and sticky end DNA fragments.



Total No. of Questions : 5]

SEAT No. :

PE1452

[6501]-440

[Total No. of Pages : 2

S.Y.B.Sc. (Vocational)

COMPUTER HARDWARE AND NETWORK ADMINISTRATION

CHNA - 331: Networking Fundamentals

(CBCS 2019 Pattern) (Paper-III) (Semester - IV) (24871)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

Q1) Solve any five of the following.

[5×1=5]

- a) What is transmission media?
- b) Define : Computer Network.
- c) Write the uses of UTP cable.
- d) What is Router?
- e) What is HTTP and why it is used?
- f) Which is better coaxial cable or fiber optic cable?

Q2) a) i) Write the benefits of Internet.

[2]

ii) Explain open system interconnection model in brief.

[4]

b) Explain server-client based Network & write it's advantages.

[4]

Q3) a) i) What is server? And write it's types.

[2]

ii) What are the advantages of digital transmission over analog transimission.

[4]

b) Explain the star Topology & write it's advantage & disadvantages. **[4]**

P.T.O.

- Q4)** a) i) What is a Network interface card? [2]
ii) Explain the different types of protocols. [4]
b) Explain fiber cable & write it's advantages. [4]

Q5) Attempt any Four of the following (Short Notes) [10]

- a) Simple mail Transfer protocol
- b) STP cable
- c) Host
- d) Cable crimping
- e) Bridge
- f) Proxy services



Total No. of Questions : 5]

SEAT No. :

PE1453

[6501]-441

[Total No. of Pages : 2

S.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

ST-2.4 : Vegetable Seed Production

(2019 Pattern) (Semester - IV) (2 Credits) (Paper - III) (24891)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Question No. 2 to Question No. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Attempt any five of the following. [5]

- a) Give the types of nursery beds.
- b) What is the isolation distance for Okra seed production.
- c) Enlist any two objectives of hybridization.
- d) Enlist the types of garden.
- e) What is mass selection?
- f) Define vegetable farming.

Q2) a) Describe the procedure for pure line selection in vegetable crops. [6]

b) Explain the types of hybridization. [4]

Q3) a) Write the procedure for hybrid seed production in Brinjal. [6]

b) Write the applications and achievement of population improvement. [4]

Q4) a) Write the seed extraction method and harvesting and storage in Onion.[6]

b) Explain the procedure for raised seed bed. [4]

P.T.O.

Q5) Write short note on any FOUR of the following.

[10]

- a) Bulk selection
- b) Transplantation.
- c) Nursery management in Tomato.
- d) Classification of vegetable crops.
- e) Explain any one nursery bed.
- f) Market garden.



Total No. of Questions : 5]

SEAT No. :

PE1455

[6501]-445

[Total No. of Pages : 2

S.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

CHNA - 332 : Microprocessor & Interfacing -II

(2019 Pattern) (CBCS) (Semester - IV) (Paper - IV) (24872)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

Q1) Solve any five of the following.

[5×1=5]

- a) What is motherboard?
- b) List different output devices.
- c) Write fullform of LAN.
- d) What are add-on cards?
- e) What is fullform of MIDI?
- f) What is Active RFID tag?

Q2) Answer the following.

- a) i) What is DVD? What is capacity of DVD? **[2]**
ii) What is scanner? Write features of scanner. **[4]**
- b) Explain the concept of Green PC. **[4]**

Q3) Answer the following.

- a) i) What is Android OS? Write any one feature of Android operating system. **[2]**
ii) Describe thick and thin concept. **[4]**
- b) Explain working of RFID system. **[4]**

P.T.O.

Q4) Answer the following.

- a) i) What is serial communication? [2]
- ii) Differentiate wired and wireless communication. [4]
- b) Explain keyboard as an input device. [4]

Q5) Write short note on any FOUR of the following. [10]

- a) Multimedia PC
- b) BIOS
- c) Sound cards
- d) Windows 8 O.S.
- e) Remote desktop sharing tools
- f) MPEG



Total No. of Questions : 5]

SEAT No. :

PE1456

[Total No. of Pages : 2

[6501]-446

S.Y. B.Sc. (Vocational)

SEED TECHNOLOGY

ST - 2.5 : Seed Quality Control

(2019 Pattern) (CBCS) (Semester - IV) (Paper - IV) (24892)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Question No. 2 to Question No. 5.
- 3) Question No. 2 to 5 carry equal marks.

Q1) Solve any five of the following : [5]

- a) Define Biofertilizer.
- b) Write any two penalties of offender.
- c) Define Seed certification.
- d) Write any two statutory bodies in India.
- e) Define control legislation.
- f) Define seed quality.

Q2) a) Explain in detail state seed certification agency. [6]

b) Explain Green manures and Trap crop. [4]

Q3) a) Write the procedure of seed certification. [6]

b) Explain specific crop standards. [4]

P.T.O.

Q4) a) Explain Seed Certification agencies. **[6]**

b) Objectives of field inspection. **[4]**

Q5) Write short notes on any four of the following : **[10]**

a) Power of Seed inspector.

b) Concept of Seed quality control.

c) Explain central seed committee.

d) Breeder seed and foundation seed.

e) Types of seed legislation.

f) Organization of seed certification.

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