

**AUTONOMOUS
THEORY EXAMINATION**

CLASS: S.Y.B.Sc SEM-IV

Course : RJSUPHY401

DAY : Monday

TIMINGS: 7:30 am – 9:30 am

DATE: 25 /03 /2019

MARKS : 60 marks

- N.B.**
1. Figures to the right indicate full marks
 2. Use of non-programmable calculator is permitted

Q. 1 All questions are compulsory**A Attempt ANY FOUR.****16 M**

- i. A thin narrow vertical slit is illuminated with monochromatic light of wavelength 6000.0 Angstroms and casts a shadow of a vertical steel wire of radius 1.1 mm and 1.0 m away on a screen 250.0 cm away from the wire. Find the fringewidth and width of the geometrical shadow. Also obtain the total number of bands that are observed.
- ii. A narrow slit is illuminated by light of wavelength λ placed at a distance of 0.4 m from a straight edge. If the distance between dark bands 6.0 and 4.0 is 0.699 mm determine the wavelength of the source if the screen is at a distance 0.5 m from the edge.
- iii. A light of wavelength 5500.0 Angstroms is placed at a distance of 11.0 cm from a narrow straight rectangular slit. If the distance between the second and the first dark band is 1.5 mm find the distance of screen from the straight edge.
- iv. A fabric with 500.0 threads/cm is illuminated by a light of wavelength 4000.0 Angstroms. Find the angle between the central image of a light and its order 3.0 diffracted image. Find the angle if the fabric is illuminated with a light of wavelength 5000.0 Angstroms.
- v. A plane transmission grating has 15000.0 lines / inch. What is the angular separation of the 6000.0 Angstroms and 5968.0 Angstroms lines of helium in the order 1.0 spectrum?
- vi. Monochromatic light of wavelength 4500.0 Angstroms falls normally on a grating 2.5 cm wide. The order 1.0 spectrum is produced at an angle 19.0 degrees from the normal. Calculate the total number of lines per meter for the grating.

B Attempt ANY ONE.**04 M**

- i. What is concept of Fresnel's half period zones. Explain using diagrams.
- ii. Explain with diagrams the working of a plane transmission grating.
- iii. Draw and explain the diffraction pattern due to a straight edge.

Q. 2 A Attempt ANY ONE.**08 M**

- i. Express mathematically a plain polarized, a circularly polarized and an elliptically polarized light. With a neat diagram explain polarization by reflection. Show that when the reflected light is plain polarized then $\tan i_p = \mu$ where i_p is the polarizing angle and μ is the refractive index of the denser medium.
- ii. Define an unpolarized light wave. Explain Polarization by Double refraction. Give characteristics of ordinary and extra ordinary rays.

12M

B Attempt ANY THREE.

- i. How will you analyze a mixture of unpolarized and elliptically polarized light.
- ii. How a linearly polarized light can be produced by Total internal reflection.
- iii. Calculate the thickness of the thinnest plate of calcite quarter wave plate for sodium light of wavelength 589.3 nm, given that the index of refraction at the given wavelength for calcite for ordinary and extra ordinary light are 1.486 and 1.658 respectively.
- iv. Explain by taking an example when one can get a Left circularly and a Right circularly polarized light.
- v. Explain how $\mathbf{D} \cdot \mathbf{k} = 0$ for a plain wave given by $\exp [i (\mathbf{k} \cdot \mathbf{r} - \omega t)]$ where \mathbf{D} is the displacement vector of vibrations and \mathbf{k} is the propagation vector

08 M

Q. 3

A Attempt ANY ONE.

- i. Describe the principle, construction and working of Febry-Perot interferometer
- ii. Explain and derive the resolving power of prism.

12M

B Attempt ANY THREE.

- i. White light fringes are formed in a Michelson's Interferometer. Now, Na-light replaces the white light source. If we displace one mirror by 0.0145 cm, the visibility of the fringes becomes minimum. Find the greater wavelength present in a Na-light. Take shorter wavelength component as 5890Å
- ii. Light is incident normally on a grating of total ruled width 5mm with 2500 lines in all. Calculate the separation of the two sodium lines in the first order spectrum. Can they be distinct? (given: $\lambda_1 = 5890\text{\AA}$, $\lambda_2 = 5896\text{\AA}$)
- iii. The monochromatic light is incident at an angle of 62° on a surface of thin transparent film of refractive index 1.33, if 6th fringe corresponds to wavelength of 600nm, find the thickness of the thin transparent film?
- iv. In Michelson's Interferometer
 - a) If a tube is 2.5cm long, which is first evacuated and then slowly filled with air ($\mu = 1.0003$), how many fringes will cross the centre? Assume $\lambda = 600\text{nm}$.
 - b) If the contrast in an Interference pattern is 50%, and if the maxima receives 15 units of light, how much do the minima receives?
- v. Calculate the useful magnifying power of a telescope of 10 cm objective. Assuming that the limit of resolution of the eye is 2 minutes of an arc. Wavelength of light used is 600nm.

*****Best of Luck*****

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W.), MUMBAI -
400086

S.Y.B.Sc. SEMESTER – IV SE EXAMINATION MARCH/APRIL - 2019
SUBJECT – Botany I

Day : Monday

Date : 25/03/2019

Time : 7.30 am. To 9.30 am.

TOTAL MARKS : 60

N.B.: 1) All questions are compulsory.

2) Draw neat and labelled diagrams wherever necessary.

3) All questions carry equal marks.

Q.1) Answer any TWO Of the following. (15)

- Describe different types of fossils and process of their formation.
- Enlist the salient features of Division Psilophyta and give outline classification of the same upto order as per G.M. Smith.
- Explain the stelar evolution in vascular plants.
- Describe the external morphology of *Selaginella* and give its systematic position with reasons.

Q.2) Answer any TWO Of the following. (15)

- Describe the external morphology of *Pinus* sporophyte.
- Describe the internal structure (T.S.) of needle in *Pinus*.
- Describe the V.S. of Ovule in *Pinus*.
- Describe T.S. of *Cordaitea* stem. Add a note on its systematic position.

Q.3) Answer any TWO Of the following. (15)

- Define Inflorescence. Describe types of Racemose inflorescence with elongated rachis.
- Describe various types of gamopetalous regular corolla.
- Assign the following plants to their respective families giving reasons.
Give economic importance of same.
i) *Michelia champaca* ii) *Coccoloba nucifera*
- Give the morphological peculiarities, systematic position and two plants of economic importance of family Apocynaceae.

Q.4) Write Short notes on any THREE Of the following. (15)

- Asexual reproduction in *Rhynia*.
- Schematic representation of life cycle of *Selaginella*.
- T.L.S. of wood in *Pinus*.
- Cardiocrarpus*.
- Cohesion of Androecium
- Hypanthodium inflorescence

***** Best of Luck *****

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), Ghatkopar(W), MUMBAI 400 086
 SYBSc SEMESTER - IV SE EXAMINATION MARCH/APRIL 2019
 SUBJECT: PHYSICS II (RJSUPHY402)

DAY: Tuesday
 DATE: 26/03/2019

TIME: 7.30 am to 9.30 am
 MAX MARKS: 60

1. All questions are compulsory.
 2. Draw neat diagrams wherever necessary.
 3. Use of logtables and nonprogrammable calculator is allowed.
 4. Symbols have their usual meaning unless stated otherwise.
 5. Number to the right indicate maximum marks.
- (Given: Mass of electron = 9.11×10^{-31} kg, mass of proton = 1.67×10^{-27} kg,
 Planck's constant = 6.67×10^{-34} Js, charge on electron = 1.6×10^{-19} C)

Q1 A Attempt any one

10

- (i) What is a wavefunction? Choose a suitable expression for wavefunction and derive Schrödinger's time dependent equation. Express it in the three dimensional form.
- (ii) What is meant by superposition of wave functions? Show that wavefunctions obey the principle of superposition but the corresponding probability densities do not follow it. What are the requirements of well behaved wavefunction?

B Attempt any one

6

- (i) A particle is limited to the x axis and has the wavefunction

$$\psi(x) = \begin{cases} ax & \text{when } 0 \leq x \leq 1, \\ 0 & \text{elsewhere.} \end{cases}$$

Find the probability that the particle can be found between $x = 0.45$ and $x = 0.55$.

- (ii) The wavefunction of a particle confined to a box of length L is

$$\psi(x) = \frac{1}{\sqrt{2L}} \exp \left[\frac{-i}{\hbar} (Et - px) \right]$$

in the region $0 \leq x \leq 2L$ and $\psi(x) = 0$ elsewhere. Calculate the probability of finding the particle in the region $0 < x < L/2$.

C Attempt any one

4

- (i) The momentum operator \hat{p} operates on the wavefunction

$$\psi(x, t) = 3x^2 e^{-i\omega t}$$

Obtain the result.

- (ii) Show that $\sin(x)$ and e^{2x} are eigenfunctions of the operator $\frac{d^2}{dx^2}$.

[P.T.O.]

- Q2 A Attempt any two** 10
- (i) Find the ground state energy of an electron confined to move in a one dimensional infinite potential well of length 1 nm.
 - (ii) Sketch the solutions of the Schrödinger's equation for a step potential when the energy of the incident particle is less than V_0 and also greater than V_0 where V_0 is the height of the potential step.
 - (iii) Consider a finite potential well of depth V_0 wherein the potential in the well is taken as zero. Write down the Schrödinger equations in different regions for $E < V_0$ and also specify the boundary conditions.
- B Attempt any one** 5
- (i) Find the reflection and transmission coefficient for a proton with energy 3 eV when it is incident on a potential step of height 2 eV.
 - (ii) Sketch the first 4 (ψ_1 to ψ_4) solutions and corresponding probability densities of the infinite potential well in one dimension.
- C Attempt any one** 5
- (i) Find the degeneracy of the state of the three dimensional cubic potential box having energy $\frac{66\pi^2\hbar^2}{2mL^2}$.
 - (ii) Consider an infinite potential well from L_1 to L_2 (instead of from 0 to L). Write down the Schrödinger's equation inside this well and its general solution. Use the boundary condition to eliminate one of the constant.
- Q3 A Attempt any two** 10
- (i) An electron with energy 1 eV is incident on a potential barrier of height 10 eV and width 1 Å. Find the transmission coefficient.
 - (ii) Sketch the first three wave functions and the corresponding probability densities of a harmonic oscillator.
 - (iii) Consider the potential barrier of width L and height V_0 . Write the Schrodinger equations in three different regions and their general solutions. Apply the boundary conditions and obtain the relations between various constants.
- B Attempt any one** 5
- (i) Sketch and compare the energy level diagrams of the infinite potential well, harmonic oscillator and the Bohr model.
 - (ii) What is the correspondence principle? Explain with examples.
- C Attempt any one** 5
- (i) Consider a potential defined as follows. $U(x) = 0$ for $x < 0$ and $x > 2L$, $U(x) = V_0$ for $0 \leq x < L$ and $U(x) = 2V_0$ for $L \leq x \leq 2L$. Sketch this potential and write down the Schrödinger equations in different regions for $E < V_0$. Also state the boundary conditions.
 - (ii) Consider a potential defined as follows. $U(x) = 0$ for $x < 0$, $U(x) = 2V_0$ for $0 \leq x < L$ and $U(x) = V_0$ for $x \geq L$. For $E > V_0$, write down the Schrödinger equations in different regions and sketch the solutions.

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous),
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S.Y.B.Sc.

SEMESTER – IV

SE. EXAMINATION MARCH/APRIL - 2019

SUBJECT – Botany II

Day : Tuesday

Time : 07.30 am. To 09.30 am.

Date : 26 /03 /2019

TOTAL MARKS : 60

N.B.: 1) All questions are compulsory.

2) Draw neat and labelled diagrams wherever necessary.

3) All questions carry equal marks.

Q.1) Answer any TWO Of the following. (15)

- With the help of neat labelled diagram, explain the secondary growth in Dicot –stem.
- What are L. girders? Describe in detail the arrangement of L. girders to achieve inflexibility with the help of suitable example.
- Define vascular bundle. Describe in detail the various types of vascular bundles studied by you.
- Describe in detail--- Xylem tissue --- components and functions

Q.2) Answer any TWO Of the following. (15)

- Write a note on composition of soil.
- What is weathering? Describe physical factors responsible for the process of weathering.
- Explain Raunkiaer's classification of plant community.
- With reference to plant community, explain-
(i) Density (ii) Frequency (iii) Biomass & cover

Q.3) Answer any TWO Of the following. (15)

- What are secondary metabolites? Discuss botanical sources and uses of glycosides.
- Discuss the functions and properties of alkaloids.
- Give an account of the botanical sources and uses of gums.
- What are volatile oils? Give functions and uses of volatile oils.

Q.4) Write short notes on any THREE Of the following. (15)

- L-girders for Inextensibility
- Secondary growth in monocot stem.
- Size classification of soil particles
- Harmful effects of Pesticides
- Concept of Pharmacopeia.
- Uses of tannins.

***** Best of Luck *****

RAMNIRANJAN JHUNJHUNWALA COLLEGE AUTONOMOUS, GHATKOPAR (W), MUMBAI – 400086
S. Y. B.Sc. SEMESTER IV SE. EXAMINATION MARCH/APRIL – 2019

SUBJECT :- PHYSICS III

Course :- RJSUPHY403

DAY : Wednesday

DATE: 27 /03 /2019

TIME: 07:30 am – 09:30 am

MAXIMUM MARKS : 60 marks

N.B.

- All questions are compulsory.
- Figures to the right indicate full marks.
- Symbols have usual meaning unless otherwise stated.
- Draw a neat diagram wherever necessary.
- Use of log table or non-programmable calculator is allowed.

Q.1 Attempt any Four of the following 20 M

- i Carry out the following subtraction using binary number system

$$(7F)_{16} - (AB)_{16}$$

- ii Explain the working of JK flip-flop with neat diagram. Give its truth table and logic symbol?
- iii Explain the operation of D flip-flop with neat diagram. Give its truth table and logic symbol?
- iv Explain operation of SIPO register with neat diagram, waveform?
- v Explain construction of binary mod-8 synchronous counter with diagram, truth table ?
- vi Explain operation of asynchronous 3 bit counter with diagram, waveform and truth table

Q.2 A Attempt any Four of the following 20 M

- i Discuss the external sources of noise affecting the received signal.
- ii With the help of block diagram explain all the elements of communication, in short.
- iii Explain the generation of pulse amplitude and pulse position modulation by drawing relevant diagrams.

- iv Discuss the theory of amplitude modulation to explain DSBSC and SSB modulation techniques.
- v Explain with diagram the FSK and PSK techniques of digital modulation.
- vi Define terms Directive gain and effective radiation power of an antenna. A half wave dipole antenna is capable of radiating 2W and has 2.55 dB gain over an isotropic antenna. How much power must be delivered to the isotropic (omnidirectional) antenna to match the field strength of directional antenna.

20 M

Q.3 A Attempt any Four of the following

- i Discuss various branches of Geophysics.
- ii Explain internal structure of the earth using neat diagram.
- iii Discuss the modern theories of formation of the Solar system.
- iv What is Palaeomagnetism? What is its significance in Geophysics?
- v What is Earth's magnetic field? Explain the angle of declination with the help of neat diagram.
- vi Define epicenter and focus of the earthquake.
What are Rayleigh waves?

*****Best of Luck*****

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W.), MUMBAI -400086
 S.Y.B.Sc. SEMESTER – IV SE EXAMINATION MARCH/APRIL - 2019
 SUBJECT – Botany III

Day : Wednesday
 Date : 27/03/2019

Time : 7.30 am. To 9.30 am.
 TOTAL MARKS : 60

- N.B.:** 1) All questions are compulsory.
 2) Draw neat and labelled diagrams wherever necessary.
 3) All questions carry equal marks.

Q.1) Answer any TWO Of the following.

(15)

- What are organ cultures? Explain root cultures and comment on their importance
- Explain the techniques of wet sterilization, dry sterilization and ultrafiltration
- With reference to recombinant DNA technology explain the activity of the following enzymes
 i) Endonucleases ii) DNA ligase iii) Terminal transferase
- What are vectors? Explain the construction of pBR 322.

Q.2) Answer any TWO Of the following.

(15)

- Define horticulture. With respect to horticulture explain Pomology and Olericulture.
- Define Garden. With respect to its location explain hedges. Add a note on suitable plants for hedges.
- What is a lawn? Explain the process of making lawn. Add a note on plants suitable for lawn.
- What are flower beds? Explain the process of making of flower beds. Add a note on suitable plants for flower beds.

Q.3) Answer any TWO Of the following.

(15)

- The height of Papaya plant in cm of a Location A and Location B is as follows. Find out the coefficient of correlation between them and comment on the result.

Location A	64	65	66	67	68	69	70
Location B	66	67	68	69	70	71	72

- Calculate X^2 for the hypothesis for the following four phenotypic class which would ideally produce a ratio of 9:3:3:1 when a white flowered and dwarf plants were crossed with recessive red and tall plants. Comment on the result.

White Short 206 Red short 83 White Tall 65 Red Tall 30

Given at DOF 3 and 5% significance, tabulated $X^2 = 7.82$

- With reference to the dedicated tools of retrieving a biological data, explain ENTREZ.
- What is Chi-square test? What are the steps involved in calculating chi-square test?

Q.4) Write short notes on any THREE Of the following.

(15)

- Organogenesis
- pUC18
- Edges

- d. Focal point
- e. Definition and Characteristics of correlation.
- f. Services provided by NCBI.

******Best of Luck ******

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI - 400086
 SYBSC SEMESTER - I V SE EXAMINATION MARCH/APRIL - 2019

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FOUNDATION COURSE- II

DAY: THURSDAY

DATE: 28/03/2019

TIME: 07.30 am -09.30 am

MAX. MARKS: 60

N.B

1. All questions are compulsory.
2. Each question has internal options.
3. Figures to the right indicate full marks.

Q.1.A. Explain the violations of Consumer Rights.

(15)

OR

Q.1.B. Discuss the important provisions of Right to Information Act 2005.

(15)

Q.2.A. Briefly talk about Anthropocentrism and Biocentrism approaches to ecology.

(15)

OR

Q.2.B. Describe the Sustainability Principle of Environment.

(15)

Q.3.A. What is ICT? Discuss the applications of ICT.

(15)

OR

Q.3.B. Discuss some of the issues relating to the use of various types of technologies.

(15)

Q.4.A. Explain the basic details of NET and SET examinations.

(15)

OR

Q.4.B. What is Time Management? Explain the effective strategies of Time Management.

(15)

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400086
 SYBSC SEMESTER-IV SEth EXAMINATION MARCH/ APRIL-2019

SUBJECT :- STATISTICS-I

DAY: Friday
 DATE: 29/03/2019

TIME: 7.30 am TO 9.30 am
 MAX. MARKS: 60

All questions are compulsory.
 Figures to the right indicate marks.

1 Attempt any TWO of the following.

- (i) Obtain M.G.F. & Cumulant Generating Function (C.G.F.) of a 10
 random variable (r. v.) X which follows Exponential distribution
 with parameter θ . Also obtain mean and variance.
- (ii) Obtain M.G.F. of a r. v. X which follows Gamma distribution 10
 with one parameter. Also obtain mean, variance and mode.
- (iii) If a r.v. follows Beta distribution of Type II, obtain an 10
 expression for r^{th} raw moment. Hence obtain mean and
 variance.

2 Attempt any TWO of the following.

- (i) Derive M.G.F. of Normal distribution with parameters (μ, σ^2) . Also 10
 find its Cumulant Generating Function (C.G.F.). Hence or
 otherwise obtain mean, variance, coefficient of skewness and
 coefficient of kurtosis of the distribution.
- (ii) If a r.v. X follows Normal distribution with parameters (μ, σ^2) , 10
 obtain mode.
- (iii) If a random variable $X \sim N(\mu, \sigma^2)$, 10
 Prove that $\mu_{2r+1} = 0$ for all r.
 $\mu_{2r} = [1.3.5.....(2r-1)] \sigma^{2r}$ for $r = 1, 2, 3...$

3 Attempt any TWO of the following.

- (i) Obtain Moment Generating Function (M.G.F.) & Cumulant 10
 Generating Function (C.G.F.) of a random variable (r. v.) X
 which follows Chi-square distribution with n degrees of freedom.
 Also obtain mean.
- (ii) Derive probability density function (p.d.f.) of Fisher's t 10
 distribution.
- (iii) If a r.v. follows F distribution, obtain an expression for r^{th} raw 10
 moment. Hence obtain mean and variance.

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400 086

S. Y. B. Sc. SEMESTER-IV END EXAMINATION, MARCH/APRIL- 2019

DAY: Friday

TIME : 2 hrs.

DATE: 29/3/19

SUBJECT : CHEMISTRY-I (RJSUCHE401)

MAX MARKS : 60

- N.B. 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of log table or non-programmable calculator is allowed.

Q1. Attempt any three of the following.

- A. Define quantum yield of photochemical reactions. How is quantum yield experimentally determined? 5
- B. State and explain Stark-Einstein's law of photochemical equivalence. Calculate Einstein if radiation of absorbed wavelength is 200nm. 5
- C. Derive an expression for decay constant. Calculate decay constant of radioactive element, which reduces to 25% of its original amount after 100 minutes. 5
- D. Explain the term "Mass Defect" and "Binding Energy". Calculate mass defect and binding energy of ${}_{16}S^{29}$. The actual mass is 28.996610amu.
 (Given $m_e = 0.00055$, $m_n = 1.00866$, $m_p = 1.00727$) 5
- E. Derive De Broglie's equation. Calculate the wavelength of a beam of particle moving with a speed of 325 m/s. The mass of particle is 1.660×10^{-27} kg.
 (Given $h = 6.626 \times 10^{-34}$ Js. $c = 3 \times 10^8$ m/s) 5

Q2. Attempt any three of the following:

- A. On the basis of valence bond theory, explain the bonding involved in $[Ni(CN)_4]^{2-}$. 5
- B. Explain the following with suitable example:
 (a) Hydrate isomerism 3
 (b) Geometrical isomerism in coordination compounds of the type MA_4B_2 2
- C. (a) Give the IUPAC name of the following:
 (i) $[Co(en)_3]Cl_3$
 (ii) $(NH_4)_2[Pt(SCN)_6]$
 (iii) $[CoCl_2(NH_3)_4]^+$
 (b) Calculate the EAN of Fe in $[Fe(H_2O)_6]^{2+}$. 2
- D. Give the name, symbol and electronic configuration of the first five elements of the first series of transition elements. 5
- E. (a) Explain, the solution containing hydrated Cu^{2+} ions is blue in colour. 3
 (b) Calculate the magnetic moment for V^{2+} ion. 2

P.T.O.

Q3. Attempt any three of the following:

- | | |
|---|---|
| A. How is benzene diazonium chloride prepared ? Discuss its mechanism. | 5 |
| B. a) Give the reaction involved in : | 3 |
| i) Sulphonation of thiophene | |
| ii) action of acetyl nitrate on pyrrole | |
| iii) Vilsmeier – Haack reaction in furan | |
| b) Explain why nucleophilic substitution in pyridine takes place at 2,4,6 positions ? | 2 |
| C. a) Give one method of preparation of : | 3 |
| i) benzyl amine ii) p-toluidine | |
| b) How is aniline converted to sulphanilic acid ? | 2 |
| D. a) Explain the aromaticity in thiophene. | 3 |
| b) Give the Paal-Knorr synthesis of pyrrole. | 2 |
| E. a) Discuss the reduction of pyridine using different reagents. | 3 |
| b) Give the synthesis of 3-nitrophenol from 3 – nitroaniline. | 2 |

Q4. Attempt any five of the following:

- | | |
|---|---|
| a. Write a note on "formation and depletion of ozone layer". | 3 |
| b. State and explain "Heisenberg's Uncertainty Principle". | 3 |
| c. Explain 'Odd-Even Rule' with suitable examples. | 3 |
| d. Discuss the structure of $\text{CoCl}_3 \cdot 6\text{NH}_3$ on the basis of Werner's theory of coordination. | 3 |
| e. Give the name and formula of the oxides of titanium. | 3 |
| f. (i) Give a balanced reaction for the action of H_2 on TiCl_4 . | 1 |
| (ii) Complete and balance the following reaction: | 1 |
| $\text{V}_2\text{O}_4 + \text{H}_2\text{SO}_4 \longrightarrow$ | |
| (iii) Give any one test for the detection of Fe^{3+} ions qualitatively. | 1 |
| g. Explain why furan undergoes electrophilic substitution more readily at position 2 rather than position 3. | 3 |
| h. What is the action of the following reagents on aniline ? | 3 |
| i) acetyl chloride ii) Chloroform in presence of alc.KOH | |
| i. Explain the relative basic strengths of aniline, diphenylamine and triphenylamine. | 3 |

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400086

S.Y.B.Sc SEMESTER-IV END EXAMINATION MARCH/APRIL- 2019

DAY: SATURDAY

SUBJECT:- CHEMISTRY-II (RJSUCHE402)

TIME: 7.30 am -9.30 am

DATE: 30-03-2019

MAX MARKS: 60

- N.B. 1. Attempt all questions.
 2. Figures to the right indicate full marks.
 3. Use of log tables or non-programmable calculator is allowed.

Q1. Answer **any three** of the following. [15]

- A a) Draw the BCC lattice and calculate the number of atoms per unit cell.
 b) Define i) unit cell ii) space lattice iii) plane of symmetry
- B a) Draw labeled diagrams showing two adjacent (111) planes in SC, BCC and FCC lattice.
 b) A substance crystallizing with FCC structure has an edge length of 628.6 pm and a density of $1.99 \times 10^3 \text{ Kg.m}^{-3}$ and Avogadro's number 6.023×10^{23} . Calculate the molar mass of the substance (in Kg.mol^{-1}).
- C a) What are different types of X-rays?
 b) i) Draw a sample X- ray diffractogram of crystalline material.
 ii) How the X- rays are produced in X- ray tube? Explain.
 c) Define catalyst poison.
- D Obtain the rate expression for enzyme catalyzed reaction given below:
- $$\text{S} + \text{E} \xrightleftharpoons[k_1]{k_{-1}} [\text{ES}] \xrightarrow{k_2} \text{P} + \text{E}$$
- E Give characteristic features of catalysis.

Q.2. Answer **any three** of the following. [15]

- A. Explain in detail, the hydration and hydrolysis of mono atomic cation in aqueous medium.
- B. Discuss the factors affecting the hydration of anion.
- C. Explain how are monoatomic anions classified on the basis of their basicity, giving examples. Also give the predominance diagram for each type.
- D. Mention any five uses of phosphoric acid.
- E. Write a note on the physical properties of oxy acids of nitrogen.

Q.3. Answer **any three** of the following. [15]

- A. Discuss the mechanism of sulfonation of nitrobenzene. Explain why the product of this reaction is more acidic than benzene sulfonic acid.
- B. What is Claisen condensation reaction? Explain its mechanism with the help of a suitable example.
- C. Give any two different methods of preparation of benzoic acid. Write the effect of an alkyl substitution on the acid strength of benzoic acid.

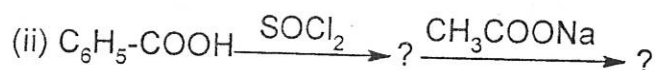
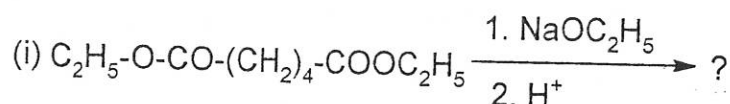
[P.T.O.]

- D. a) How will you prepare picric acid from phenol by ipso substitution?
 b) Give the action of following on benzoic acid.
 i) soda lime / heat ii) LiAlH_4
- E. a) How will you convert:
 i) salicylic acid to acetylsalicylic acid.
 ii) sodium benzoate to ethyl benzoate.
 b) Give the preparation of ethylbenzene sulfonate.

Q.4. Answer **any five** of the following.

[15]

- a) Explain law of rational indices.
 b) What are nanoparticles?
 Give their catalytic importance with suitable examples.
 c) Distinguish between heterogeneous and heterogeneous catalysis.
 d) On the basis of Z^2/r value, how are the monoatomic cations classified?
 e) Mention any three oxy acids of sulphur with their chemical formula and give the oxidation number of sulphur in those oxy acids.
 f) Draw the predominance diagram for moderately acidic and strongly acidic cations.
 g) Complete the following reactions.



- h) Write the product of sulfonation of the following.
 (i) phenol (ii) toluene (iii) benzenesulfonic acid
- i) Give one example each of decarboxylation and desulfonation reaction.

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400086

SYBSC SEMESTER-IV SE EXAMINATION MARCH/ APRIL-2019

SUBJECT :- STATISTICS-II

DAY: Saturday

TIME: 07.30am – 09.30am

DATE: 30/03/2019

MAX. MARKS: 60

N.B. All questions are compulsory.

Q1 Attempt any two sub questions :-

- a. Stating clearly the mathematical model and assumptions in one way classification, derive the formulae for the least square estimates of the parameters μ and α_i in terms of sample observations. (10)
- b. In one way classification, write mathematical model and assumptions. Further prove that (10)
 - i) $E(S_{Tr}^2) = \sum_{i=1}^k n_i \alpha_i^2 + (K - 1) \sigma^2$
 - ii) $E(S_T^2) = \sum_{i=1}^k n_i \alpha_i^2 + (N - 1) \sigma^2$
- c. State the formulae for the least square estimates of the parameters in two way classification model and prove that (10)

$$E = \left[\sum_{i=1}^p \sum_{j=1}^q y_{ij}^2 - \frac{G^2}{N} \right] - \left[\frac{\sum_{i=1}^p T_i^2}{q} - \frac{G^2}{N} \right] - \left[\frac{\sum_{j=1}^q T_j^2}{p} - \frac{G^2}{N} \right]$$

Q2 Attempt any two sub questions :-

- a. i. Explain the terms with reference to designs of experiments: (04)

Treatment, Block, Experimental error.
- ii. Write a note on Principles of designs of experiments. (06)
- b. Give a complete analysis of completely randomized design. (10)
- c. Explain randomized block design and give its layout using 3 treatments and 4 blocks. Further explain advantages and disadvantages of this design. (10)

Q3 Attempt any two sub questions :-

- a. Derive the formula to estimate a missing observation in randomized block design. Further also explain how degrees of freedom can be adjusted in ANOVA. (10)
- b. Give a complete analysis of latin square design. (10)
- c. In 2^3 factorial experiment, obtain four possible simple effects of A and hence derive the formulae for main effect of A, interaction effect AB and interaction effect ABC. (10)

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400086

S.Y.B.Sc SEMESTER- IV END EXAMINATION MARCH/APRIL- 2019

DAY: Monday

SUBJECT:- CHEMISTRY (RJSUCHE403) TIME: 7.30 am -9.30 am

DATE: 01/04/2019

MAX MARKS: 60

N.B.

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks
- 3) Use of log table or non- programmable calculators is allowed.

Q.1. Answer any three questions of the following.**(15)**

- A. What is Gaussian distribution curve? What are its salient features?
- B. For the set of observations given in the following table, derive an equation of the type $y = mx + c$, by the method of averages.

x	1	2	3	4	5	6	7
y	2.8	4.2	5.2	6.4	6.8	7.8	9.0

- C. Explain different methods used for locating the separated components in TLC.
- D. Write a note on "Test of significance"
- E. What is chromatography? Discuss the classification of chromatographic methods on the basis of physical states of the two phases.

Q.2. Answer any three questions of the following.**(15)**

- A. What are the different graphic methods used for determining equivalence point in potentiometric titrations? Discuss any two of these methods.
- B. In a certain solvent extraction, the distribution ratio of the solute in favour of organic solvent is 25. Calculate the percentage extraction for single extraction, using volume ratio:
 - i) $V_o / V_w = 0.5$, and
 - ii) $V_o / V_w = 8.0$
- C. 200 cm^3 of an aqueous solution containing 100 mg of a solute is equilibrated with 15 cm^3 of ether each time. Calculate minimum number of extractions required so that not more than 1 mg of solute remains in the aqueous phase. Given $D_{o/w} = 22$.
- D. Discuss the nature of conductometric titration curve in the titration of:
 - i) HCl against NaOH, and
 - ii) CH_3COOH against NH_4OH
- E. State and explain Nernst distribution law, with reference to deviations therefrom.

Q.3. Answer any three questions of the following.

(15)

- A. What is metallurgy? Explain the following terms w.r.t. concentration of ores.
 - i. Magnetic separation and ii. Froth flotation.
- B. What is an ore? Discuss the following terms involved in hydrometallurgy.
 - i. Leaching and ii. Displacement.
- C. Discuss refining of copper.
- D. Explain different sources and toxic effects of hydrocarbons as an air pollutant.
- E. Give the different sources and their consequences of following air pollutants:
 - i. Oxides of nitrogen and ii. Oxides of sulphur.

Q.4 Answer any five questions of the following.

(15)

- a. Explain the criteria used for the selection of solvent system in TLC.
 - b. Distinguish between TLC and paper chromatography.
 - c. Estimation of glucose in blood sample gave following results:
mg of glucose: 105, 101, 106, 105, 108, 108
Can the value 101 be rejected on the basis of Q test? ($Q_{tab} = 0.56$)
 - d. Discuss principle of potentiometric titrations.
 - e. What is conductometric titration? Mention any two limitations of conductometric titrations.
 - f. Write any three advantages of conductometric titrations.
 - g. Discuss in brief carbon neutrality.
 - h. Write a note on "Bhopal gas tragedy".
 - i. Explain the terms :Toxicology&Toxicants
-

RAMNIRANJAN JHUNJHUNWALA COLLEGE (Autonomous), GHATKOPAR (W), MUMBAI-400086

SYBSC SEMESTER-IV SE EXAMINATION MARCH/ APRIL-2019

SUBJECT :- STATISTICS-III

DAY: Monday

TIME: 7.30 - 9.30

DATE: 01 / 04 / 2019

MARKS: 60

- N.B. -- 1) All questions are compulsory.
2) Attempt any TWO sub-questions from each question.
3) Figures to the right indicate marks.

- Q. 1. a) i) Define Earliest expected time and Latest allowable time defined for an event. 10
ii) Write a note on three time estimates defined for an activity in PERT and CPM.

- b) Draw the network, identify the critical path and calculate total float and independent float for the following data ---- 10
- | | | | | | | |
|---------------|---------|---------|---------|---------|---------|---------|
| Activity ---- | 100-200 | 100-300 | 100-400 | 200-400 | 200-500 | 300-600 |
| Time ---- | 5 | 13 | 11 | 9 | 7 | 9 |
| ---- | 400-600 | 500-700 | 600-700 | 600-800 | 700-800 | 800-900 |
| ---- | 11 | 11 | 1 | 9 | 11 | 7 |

- c) Draw the network, calculate expected time and variance of each activity and identify the critical path for the following data. ---- 10
- | | | | | | | | | | |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Activity ---- | 1-2 | 2-3 | 2-4 | 3-5 | 3-6 | 4-6 | 5-7 | 6-7 | 7-8 |
| t_o ---- | 4 | 5 | 4 | 10 | 15 | 8 | 4 | 1 | 6 |
| t_M ---- | 6 | 7 | 8 | 18 | 20 | 9 | 8 | 2 | 7 |
| t_P ---- | 8 | 15 | 12 | 26 | 25 | 16 | 12 | 3 | 8 |

- Q. 2. a) For a 2×2 game problem without saddle point, derive the expressions for the optimum strategies for players A and B. Also obtain an expression for the value of the game. 10
- b) i) Explain Max – Min and Min – Max principles for players A and B. 10
ii) Explain the procedure of converting a $m \times n$ game problem to a Linear Programming Problem for player A.

- c) i) Solve the following game problem whose pay-off matrix is as follows: 10

	player B			
player A	1	7	3	4
	5	6	4	5
	7	2	0	3

- ii) Solve the following game problem graphically ----

		player B			
player A	-	6	-1	4	3
	7	-	2	-5	7

- Q. 3. a) Explain decision making under uncertainty using the following criteria: 10
Max - Min, Max - Max, Min - Max Regret, Laplace and Hurwicz.

- b) The ABC company manufactures its product for Rs. 10 and sells it for Rs. 15. If it is not sold, it is disposed off, its scrap value being Rs. 4. 10
The demand for its product is given below ----

Demand (units) ----	4	6	8	10	12
Probability ----	0.2	0.15	0.25	0.3	0.1

Obtain the best decision regarding number of units to be produced.
Also, calculate EVPI.

- c) For the following pay-off matrix, obtain best decision using 10
(i) Max-Min (ii) Max-Max (iii) Laplace (iv) Hurwicz ($\alpha = 0.6$) and
(v) Min-Max Regret criterion.

Event	course of action		
	A ₁	A ₂	A ₃
S ₁	30000	60000	40000
S ₂	20000	30000	10000
S ₃	10000	20000	-16000

----- XXXXX -----

RAMNIRANJAN JHUNJHUNWALA COLLEGE (AUTONOMOUS), GHATKOPAR (W), MUMBAI- 86
 S.Y.B.Sc. SEMESTER IV EXAMINATION MARCH/ APRIL 2019
 SUBJECT -ZOOLOGY
 RJSUZOO301

DAY: TUESDAY
 DATE: 2-04-2019

TIME: 7.30 to 9.30 am
 MAX MARKS: 60

- NOTE: 1. All question are compulsory
 2. Figures to the right indicate full marks
 3. Draw neat and labeled diagram wherever necessary.

Q.1 Answer the following

- a) Enlist various functions of Lysosomes. (08)
 b) Explain the ultrastructure of Mitochondria. (07)

OR

Q1. Write notes on

- a) Origin and Polymorphism of Lysosomes. (05)
 b) Explain the concept of membrane fluidity. (05)
 c) Exocytosis and Endocytosis. (05)

Q.2 Answer the following

- a) Describe the structure of heart of mammal. (08)
 b) Give an account on the movement of cilium and flagellum. (07)

OR

Q2. Write notes on

- a) Single and double circulation. (05)
 b) Control coordination of ciliary movements. (05)
 c) Infraciliation in Paramecium. (05)

Q.3 Answer the following

- a) Female reproductive system of cockroach. (08)
 b) Digestive system of cockroach. (07)

OR

Q3. Write notes on

- a) Nerve ring of cockroach. (05)
 b) Respiratory system of cockroach. (05)
 c) Describe wings, leg and eye in cockroach. (05)

Q4. Answer the following

- a) Modification of Endoplasmic reticulum OR a) Lampbrush chromosomes. (05)
 b) Structure of Neuron OR b) Blood as circulating fluid. (05)
 c) Systemic position of cockroach. OR c) Mouth parts of cockroach. (05)

RAMNIRANJAN JHUNJHUNWALA COLLEGE (AUTONOMOUS),
GHATKOPAR (W), MUMBAI 400 086

S. Y. B. Sc. SEMESTER -IV SE EXAMINATION, APRIL 2019

SUBJECT: MATHEMATICS-I

DAY : TUESDAY

TIME : 07.30 a. m. to 09.30 a. m.

DATE: 02nd April, 2019

MAX. MARKS: 60

Instructions: 1. All questions are compulsory.

2. Figures to the right indicate full marks of the question.

3. Use of a calculator or any electronic device is not allowed.

Q.1. A) Attempt any one.

[08]

(i) Prove that a monotonic function $f : [a, b] \rightarrow \mathbb{R}$ is Riemann integrable on $[a, b]$.

(ii) State and prove second fundamental theorem of calculus.

Q.1. B) Attempt any two.

[12]

(i) Find $L(f, P)$ and $U(f, P)$ for $f(x) = 3x+2$, $I = [1, 5]$ (Take $P = \{1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5\}$).

(ii) Check whether the function $f : [0, 1] \rightarrow \mathbb{R}$ defined by $f(x) = \begin{cases} 1 & \text{for } x \in [0, 1] \cap \mathbb{Q} \\ 0 & \text{for } x \in [0, 1] \setminus \mathbb{Q} \end{cases}$ is Riemann integrable.

(iii) Find a point $c \in [0, 1]$ such that $\int_0^1 \frac{x}{1+x^2} dx = c \int_0^1 \frac{1}{1+x^2} dx$.

(iv) Let $F(x) = \int_{\sin x}^{\cos x} e^{-t^2} dt$, $0 \leq x \leq \frac{\pi}{2}$. Then find $F'(\frac{\pi}{4})$.

Q.2. A) Attempt any one.

[08]

(i) Let $f : [a, b] \rightarrow \mathbb{R}$ be a continuously differentiable function such that $\forall x \in [a, b]$, $f(x) \geq 0$. Then prove that the volume of solid of revolution obtained by revolving the curve $y = f(x)$ about the x -axis from $x = a$ to $x = b$ is $\int_a^b \pi (f(x))^2 dx$.

(ii) If $f(x)$ and $g(x)$ are two positive functions $\forall x \geq 0$ and such that $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = L$, a nonzero finite number, then both $\int_0^\infty f(x) dx$ and $\int_0^\infty g(x) dx$ behave alike.

Q.2. B) Attempt any two.

[12]

(i) Find the arc length of the curve $x = t^2$, $y = t^3$ that lies between the points $(1, 1)$ and $(4, 8)$.

(ii) Find the area of the surface generated by rotating one arc of the cycloid $x = r(t - \sin t)$, $y = r(1 - \cos t)$ about the x -axis.

(iii) Examine the convergence of $\int_0^2 \frac{1}{(x+1)\sqrt{2-x}} dx$.

(iv) Evaluate $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta$.

Q.3. A) Attempt any one.

[08]

(i) Define the triple integral of a bounded function $f : E \rightarrow \mathbb{R}$ where $E = [a_1, b_1] \times [a_2, b_2] \times [a_3, b_3]$. Show with usual notation that

$$m(b_1 - a_1)(b_2 - a_2)(b_3 - a_3) \leq \iiint_E f(x, y, z) d(x, y, z) \leq M(b_1 - a_1)(b_2 - a_2)(b_3 - a_3).$$

(ii) Prove that a continuous function $f : S \rightarrow \mathbb{R}$, where $S = [a, b] \times [c, d]$ is integrable on S .

Q.3. B) Attempt any two.

[12]

(i) Let $f(x, y) = (1+x) \sin y$ and S is the trapezoid with vertices $(0, 0)$, $(1, 0)$, $(1, 2)$ and $(0, 1)$. Sketch the region S of integration. Write both the iterated integrals and use Fubini's theorem to evaluate $\iint_S f(x, y) d(x, y)$.

(ii) Evaluate the double integrals by changing to polar coordinates: $\int_0^{\sqrt{2}} \int_y^{\sqrt{4-y^2}} \frac{1}{1+x^2+y^2} dx dy$.

(iii) Sketch the region of integration and evaluate the integral $\int_0^2 \int_{y/2}^1 e^{x^2} dx dy$ by reversing the order of integration.

(iv) Evaluate $\int_0^1 \int_0^z \int_0^{x+z} 6xz dy dx dz$.

RAMNIRANJAN JHUNJHUNWALA COLLEGE (AUTONOMOUS), GHATKOPAR (W), MUMBAI- 86
S.Y.B.Sc. SEMESTER IV EXAMINATION MARCH/ APRIL 2019
SUBJECT –ZOOLOGY
RJSUZOO402 (Biochemistry-II, Chromosomal inheritance and evolution.)

DAY: Wednesday
DATE: 03/04/2019

TIME: 7.30 am to 9.30 am

MAX MARKS: 60

- NOTE:** 1. All questions are compulsory and carry equal marks.
2. Figures to the right indicate full marks.
3. Draw neat and labeled diagram wherever necessary.

Q.1 Answer the following.

- a) Give an overview of protein metabolism. (08)
- b) Describe the formation of ketone bodies. (07)

OR

- a) Discuss the transamination of amino acids. (05)
- b) Write a note on respiratory distress syndrome. (05)
- c) Describe the transportation of fatty acids in mitochondria. (05)

Q.2 Answer the following.

- a) Describe the XX-XY mechanism of inheritance in man. (08)
- b) Explain the genic balance theory of sex determination in *Drosophila*. (07)

OR

- a) Giving example of crew hen, explain phenomena of sex reversal in birds. (05)
- b) Discuss the types of chromosomes. (05)
- c) Write a note on gynandromorphs. (05)

Q.3 Answer the following.

- a) Explain the concept of Darwinism. (08)
- b) What is microevolution? Discuss factors which can cause microevolution. (07)

OR

- a) Explain the concept and limitations of Lamarckism. (05)
- b) Explain role of natural selection in microevolution (05)
- c) Write a note on Paleozoic era (05)

Q.5 Write notes on

- a) Unsaturated fatty acids. (05)

OR

- a) Metabolic disorders of urea cycle. (05)
- b) Y-linked inheritance. (05)

OR

- b) Barr body. (05)
- c) Mutation theory of evolution (05)

OR

- c) Cenozoic era (05)

RAMNIRANJAN JHUNJHUNWALA COLLEGE(Autonomous), Ghatkopar(w), Mumbai-400 086

SYBSC SEMESTER - IV SE MARCH/April - 2019

SUBJECT : MATHEMATICS – II

Day : Wednesday

Time: 7.30 am to 9.30 am

DATE : 03rd April 2019

Max. Marks: 60

Instructions: All questions are compulsory.

Figures to the right indicate full marks of the question.

Q.1 A Attempt ANY ONE from the following: [08]

- (i) Derive the group of symmetries of an equilateral triangle using permutations.
- (ii) Prove that a non-empty subset H of group G is a subgroup if and only if for any $a, b \in H$, $ab^{-1} \in H$

B Attempt ANY TWO from the following: [12]

- (i) Prove that $G = \{ \bar{5}, \bar{15}, \bar{25}, \bar{35} \} \pmod{40}$ under multiplication of residue classes modulo 40, is a group.
- (ii) In a group G , Prove that
 - (i) $(a^{-1})^{-1} = a \quad \forall a \in G$
 - (ii) $(ab)^{-1} = b^{-1}a^{-1} \quad \forall a, b \in G$
 - (iii) For $a, x, y \in G$, If $a.x = a.y$ then $x = y$
- (iii) Find order of
 - (a) $\bar{2}^{40}$ in a group $(\mathbb{Z}_{180}, +)$
 - (b) α^4 in a group (S_3, \circ) where $\alpha = (1 \ 3 \ 2) \in S_3$
- (iv) If a is a generator of a cyclic group G , then prove that a^{-1} is also a generator of G .

Q.2 A Attempt ANY ONE from the following: [08]

- (i) Let G be a group and $a \in G$, then prove that $\langle a \rangle = \{a^n : n \in \mathbb{Z}\}$ is the smallest subgroup of G containing a .
- (ii) Prove that a finite group G is cyclic if and only if there exists an element $a \in G$ such that $o(a) = o(G)$.

B Attempt ANY TWO from the following: [12]

- (i) Are the following groups cyclic? Give reasons.
 - (i) The Klein-4 group
 - (ii) The dihedral group D_4
 - (iii) $(\mathbb{Q}, +)$

- (ii) Let G be a cyclic group of order n . If d is a positive divisor of n , then prove that the number of elements in G of order d is $\phi(d)$.
- (iii) (a) Prove that every cyclic group is abelian.
(b) list all the generators of a cyclic group $G = \langle a \rangle$ of order 12.
- (iv) Find all subgroups of $(\mathbb{Z}_{18}, +)$.

Q.3 A Attempt ANY ONE from the following:

[03]

- (i) State and prove Lagrange's theorem.
- (ii) Let G_1 and G_2 be two groups and $f: G_1 \rightarrow G_2$ be a group homomorphism, then prove that
 - (i) $f(e_1) = e_2$, where e_1 and e_2 are identities of group G_1 and G_2 respectively.
 - (ii) For $a \in G_1$, $f(a^{-1}) = (f(a))^{-1}$
 - (iii) For $a \in G_1$, $f(a^n) = (f(a))^n \quad \forall n \in \mathbb{Z}$

B Attempt ANY TWO from the following:

[12]

- (i) Find all the distinct left cosets of subgroup $H = \{e, a, a^2, a^3\}$ of group $G = D_4 = \{e, a, a^2, a^3, b, ab, a^2b, a^3b\}$, where $a^4 = e$, $b^2 = e$ and $aba = b$
- (ii) Let G be a group of prime order p , then prove that G is a cyclic group with every non-identity element of G is a generator of G .
- (iii) Let $f: (\mathbb{R}, +) \rightarrow (\mathbb{R}^+, \cdot)$ be defined by $f(x) = e^x \quad \forall x \in \mathbb{R}$. Prove that f is a group homomorphism. Is f an isomorphism? Justify your answer.
- (iv) Let $f: \mathbb{Z} \rightarrow \mathbb{Z}_{17}$ be a group homomorphism with $f(1) = \bar{4}$. Find $f(35)$ and $\ker f$.

***** End *****

S. Y. B. Sc. SEMESTER -IV SE EXAMINATION, APRIL 2019

SUBJECT: Differential Equations

DAY : THURSDAY

TIME : 07.30 a.m. to 09.30 a.m.

DATE: 4th April, 2019

MAX. MARKS: 60

Instructions: 1. All questions are compulsory.

2. Figures to the right indicate full marks of the question.

3. Use of a scientific calculator is allowed.

Q.1. A) Attempt any one.

[08]

(i) Explain the methods of solving first order linear and Bernoulli's differential equations.

(ii) State existence-uniqueness theorem for the first order ordinary differential equations. Show that $\frac{dy}{dx} = x + 4y$ where $(x, y) \in [-1, 1] \times \mathbb{R}$ with the initial condition $y(0) = 1$, has unique solution. Also give an example of a differential equation with an initial condition such that it has more than one solution. Does it contradict the existence-uniqueness theorem? Justify your answer.

Q.1. B) Attempt any two.

[12]

(i) Solve: $(x^2 + y^2 + 1)dx - 2xydy = 0$.

(ii) Solve: $\frac{dy}{dx} = \frac{4x+y-6}{x-4y+7}$.

(iii) Find orthogonal trajectory of the family $x^2 - y^2 = C$.

(iv) What percentage of the original amount of C-14 remained in the bone of a person who died 1500 years ago?

Q.2. A) Attempt any one.

[08]

(i) Let y_1 and y_2 be solutions of $y'' + Py' + Qy = 0$ on $[a, b]$. Prove that y_1 and y_2 are linearly dependent if and only if their Wronskian is identically zero on $[a, b]$.

(ii) Explain the method of solving second order constant coefficient linear differential equation.

Q.2. B) Attempt any two.

[12]

(i) Show that $y = c_1 e^x + c_2 e^{2x}$ is a general solution of $y'' - 3y' + 2y = 0$ on any interval and find the particular solution for which $y(0) = -1$, $y'(0) = 1$.

(ii) Prove that two solutions of $y'' + P(x)y' + Q(x)y = 0$ on $[a, b]$ are linearly dependent if they have a common zero in $[a, b]$.

(iii) Verify that $y_1 = x$ is a solution of $(1 - x^2)y'' - 2xy' + 2y = 0$ and find its general solution.

(iv) Solve Cauchy-Euler equation: $x^2y'' - 2xy' - 4y = 0$.

Q.3. A) Attempt any one.

[08]

(i) State and prove the Sturm Separation Theorem.

(ii) State and prove the Sturm Comparison Theorem.

Q.3. B) Attempt any two.

[12]

(i) Using the method of undetermined coefficients, solve: $y'' + 4y = 3 \sin 2x$.

(ii) Using the method of variation of parameters, solve: $y'' + y = \sec^2 x$.

(iii) Prove that any nontrivial solution of Bessel's equation has infinitely many zeros on the positive X-axis.

(iv) Determine, with justification, whether the following are oscillatory or non-oscillatory:

(a) $y'' + e^x y = 0$ (b) $y'' - e^x y = 0$.

SUBJECT –ZOOLOGY

RJSUZOO403 (Parasitology, Animal Husbandry and Behavioral Ethology)

DAY: Thursday
DATE: 04/04/2019

TIME: 7.30 -9.30 am
MAX MARKS: 60

- NOTE: 1. All question are compulsory and carry equal marks.
2. Figures to the right indicate full marks.
3. Draw neat and labeled diagram wherever necessary.

- Q.1 Answer the following** **15M**
a. Give a detailed account on life cycle of *Entamoeba histolytica*. 8M
b. Describe life cycle of tape worm. 7M

OR

- Q.1 Answer the following** **15M**
Discuss metastatic lesion due to infection of *Entamoeba histolytica*. 5M
a. Give a brief account on pathogenicity of *Leshmania donovani*. 5M
c. Write a note on life cycle of *Fasciola hepatica*. 5M

- Q2. Answer the following.** **15M**
a. Give an account of drought and dual purpose breeds of cattles. 8M
b. Give brief account of poultry diseases. 7M

OR

- Q2. Answer the following.** **15M**
a. Give an account of natural hatching in chicken. 5M
b. Explain pasteurization and aseptic filling of milk. 5M
c. Give an account of lactose and vitamins of milk. 5M

- Q3. Answer the following.** **15M**
a. Describe the courtship behaviour in great crested grebe. 8M
b. Discuss the communication in animals by visual display. 7M

OR

- Q.3 Describe the following.** **15M**
a. Special glands in animals for chemical communication. 5M
b. Innate behaviour. 5M
c. Waggle dance in bees. 5M

- Q4. Write short notes on.** **15M**
a. Morphology of tape worm

OR

- a. Morphology of *Leshmania donovani*
b. Nagpuri buffalo

OR

- b. Rhode Island Red
c. Filial imprinting

OR

- c. Advantages of communication
