Reg. No.

VI Semester B.Sc. 4/3 Degree Examination, September - 2020
CHEMISTRY - I
(Regular/Repeaters)
Paper-I

Time : 3 Hours   **Maximum Marks : 80**

Instructions to Candidates:

1) All questions are compulsory.

   ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳು ಕಡ್ಡಾಯವಾಗಿವೆ.

2) Answer all the questions in the same answer book.

   ಎಲ್ಲಾ ಉತ್ತರಗಳನ್ನು ಒಂದೇ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆಯಿರಿ.

3) Draw neat diagrams and give equations wherever necessary.

   ಅವಶ್ಯವಿದ್ದಲ್ಲಿ ಸಮೀಕರಣಗಳನ್ನು ಮತ್ತು ಆಕೃತಿಗಳನ್ನು ಕೊಡಿರಿ.

SECTION - A
ವಿಭಾಗ – ಎ

1. Answer **any Ten** of the following.   (10×2=20)

    ಕೆಳಗಿನವುಗಳಲ್ಲಿ ಬೇಕಾದ **ಹತ್ತಕ್ಕೆ** ಉತ್ತರಿಸಿರಿ.

    a) Mention the factors affecting 10 Dq.

        10 ಡಿಕ್ಯೂನ ಪರಿಣಾಮ ಬೀರುವ ಬಗ್ಗೆ ಪ್ರಸ್ತಾಪಿಸಿರಿ.

    b) What are strong field and weak field Ligands ?

        ಸ್ಟ್ರಾಂಗ್ ಫಿಲ್ಡ್ ಮತ್ತು ವೀಕ ಫಿಲ್ಡ್ ಎಂದರೇನು ?

    c) The dissociation constant of the complex ion $[Cu(NH_3)_4]^{2+}$ is $1.0×10^{-12}$. Calculate its stability constant.

        $[Cu(NH_3)_4]^{2+}$ ಸಂಕೀರ್ಣ ಸಂಯುಕ್ತ ಆಯಾನಿನ ವಿಯೋಜನ ಸ್ಥಿರಾಂಕ $1.0×10^{-12}$ ಇದೆ. ಇದರ ಸ್ಥಿರತಾ ನಿಯತಾಂಕ ಕಂಡು ಹಿಡಿಯಿರಿ.

    d) Write the structural formula of Ziese's salt.

        ಝಿಸಿಸ್ ಸಾಲ್ಟ್‌ನ ರಚನಾ ಸೂತ್ರ ಬರೆಯಿರಿ.

    e) Write the conformational formula of α-D(+) glucose.

        α-D(+) ಗ್ಲೂಕೋಸ್‌ನ ವಿನ್ಯಾಸ ಸೂತ್ರ ಬರೆಯಿರಿ.

    f) Write the configurational formula of L - alanine.

        ಎಲ್ – ಆಲ್ಯಾನಿನ್ ಕಾನ್‌ಫೀಗ್ರೇಶನ್ನಲ್ ಸೂತ್ರ ಬರೆಯಿರಿ.

g) Define electrophoresis.

   ಎಲೆಕ್ಟ್ರೊಫೊರೇಸ್ ವ್ಯಾಖ್ಯಾನಿಸಿ.

h) What is isoprene rule ?

   ಐಸೊಪ್ನ್ ರೂಲ್ ಎಂದರೇನು ?

i) What is meant by photoelectric effect ?

   ಫೋಟೋಎಲ್ಟ್ರೆಕ್ ಎಂದರೇನು ?

j) Dipole moment of CO_2 is zero. Where as that of H_2O is 1.84D. Give reason.

   H_2O ನ ದ್ವಿಧ್ರುವಿ ಭ್ರಾಮ್ಯಕ 1.84D ಆದರೆ CO_2 ದ್ದು ಶೂನ್ಯವಾಗಿದೆ. ಕಾರಣ ಕೊಡಿ.

k) What is thermoplastic polymer ? Give an example.

   ಥರೋಮ್ಪ್ಲಾಸ್ಟಿಕ್ ಎಂದರೇನು ? ಉದಾಹರಣೆ ಕೊಡಿ.

l) Define de-Broglie hypothesis.

   ಡಿ – ಬ್ರೋಗಲಿಯ ಊಹೆಯನ್ನು ವ್ಯಾಖ್ಯಾನಿಸಿ.

SECTION - B

ವಿಭಾಗ – ಬಿ

Answer **any Four** of the following. (4×5=20)

ಕೆಳಗಿನವುಗಳಲ್ಲಿಯ ಬೇಕಾದ **ನಾಲ್ಕಕ್ಕೆ** ಉತ್ತರಿಸಿರಿ.

2. What is meant by crystal field stabilisation energy ? Mention the limitations of crystal field theory.

   ಪರಿಭ್ರಮಣದ ಸ್ಫಟಿಕ ಕ್ಷೇತ್ರ ಸ್ಥಿರ ಶಕ್ತಿ ಎಂದರೇನು ? ಸ್ಫಟಿಕ ಕ್ಷೇತ್ರ ಸ್ಥಿರ ಸಿದ್ಧಾಂತದ ಮಿತಿಗಳನ್ನು ಬರೆಯಿರಿ.

3. What is 18-electron rule ? Discuss 18-electron rule for $[Fe(CO)_5]$ and ferrocene.

   18- ಎಲೆಕ್ಟ್ರಾನ್ ರೂಲ್ ಎಂದರೇನು ? $[Fe(CO)_5]$ ಮತ್ತು ಫಿರೊಸಿನ್ ಸಂಯುಕ್ತಗಳಿಗನುಗುಣವಾಗಿ 18- electron ನಿಯಮ ಚರ್ಚಿಸಿ.

4. Give the conversion of glucose into fructose.

   ಗ್ಲುಕೋಸ್ನ್ನು ಪ್ರುಕ್ಟೋಸಾಗಿ ಪರಿವರ್ತಿಸುವುದನ್ನು ವಿವರಿಸಿರಿ.

5. Explain the synthesis of vitamin-A by Van drop etal method.

   ವ್ಯಾನ್ ಡ್ರಾಪ್ ಇಟಾಲ್ ಪದ್ಧತಿಯಿಂದ ಜೀವಸತ್ವ 'A' ಯ ಸಂಶ್ಲೇಷಣೆ ಕೊಡಿರಿ.

6. Explain with a suitable potential energy curve, the Franck-condon principle.

   ಸೂಕ್ತ ಶಕ್ತಿಸ್ಥಿತಿ ವಕ್ರರೇಖೆಯ ಸಹಾಯದಿಂದ ಇಲೆಕ್ಟ್ರಾನು ರೋಹಿತದಲ್ಲಿನ ಫ್ರಾಂಕ್ – ಕಾಂಡನ್ ತತ್ವದಿಂದ ನಿದರ್ಶಿಸಿರಿ.

7. Explain the measurement of dipole moment by temperature variation method.

   ಉಷ್ಣತೆ ಬದಲಾವಣೆ ವಿಧಾನದಿಂದ ದ್ವಿಧ್ರುವೀ ಭ್ರಾಮ್ಯಕ ಕಂಡುಹಿಡಿಯುವುದನ್ನು ವಿವರಿಸಿರಿ.

SECTION - C

ವಿಭಾಗ – ಸಿ

Answer **any four** of the following.　　　　　　　　(4×10=40)

ಈ ಕೆಳಗಿನ ಬೇಕಾದ **ನಾಲ್ಕನ್ನು** ಬಿಡಿಸಿರಿ.

8. a) Write a note on colour and magnetic properties of co-ordination complexes.

   ಬಣ್ಣ ಮತ್ತು ಕಾಂತೀಯ ಗುಣದ ಬಗ್ಗೆ ಕೋ–ಆರ್ಡಿನೇಶ್ ಸಂಯುಕ್ತದ ಮೇಲೆ ಟಿಪ್ಪಣ ಬರೆಯಿರಿ.

   b) Explain the crystal field splitting of d-orbitals in square planar complexes according to crystal field theory.

   ಸ್ಟಟಿಕ ಕ್ಷೇತ್ರ ಸಿದ್ಧಾಂತ ಪ್ರಕಾರ ಸ್ಕ್ವೇರ್ ಪ್ಲಾನರ್ ಸಂಕೀರ್ಣಗಳಲ್ಲಿ d – ಆರ್ಬಿಟಲ್ಸ್‌ಗಳ ಸ್ಟಟಿಕ ಕ್ಷೇತ್ರ ವಿಭಜನೆಯನ್ನು ವಿವರಿಸಿರಿ.

9. a) Explain the factors affecting stability of metal complexes.

   ಲೋಹ ಸಂಯುಕ್ತಗಳ ಸ್ಥಿರತೆ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುವ ಅಂಶಗಳನ್ನು ವಿವರಿಸಿರಿ.

   b) Explain Bergmann synthesis of a Dipeptide.

   ಬರ್ಗ್‌ಮನ್‌ನ ವಿಧಾನದಿಂದ ಡೈ ಪೇಪ್ಟೈಡ್ ಸಂಶ್ಲೇಷಣೆಯನ್ನು ವಿವರಿಸಿರಿ.

10. a) Discuss the primary and secondary structure of proteins.

    ಪ್ರೊಟೀನ್‌ನಿನ ಪ್ರೈಮರಿ ಮತ್ತು ಸೆಕಂಡರಿ ಸೂತ್ರವನ್ನು ವಿವರಿಸಿರಿ.

    b) Give the constitution of citral.

    ಸಿಟ್ರಾಲ್ ಕಾನ್‌ಸ್ಟಿಟ್ಯೂಶನ್ ಕೊಡಿರಿ.

11. a) Deduce Einstein's photoelectric equation.

    ಐನ್‌ಸ್ಟೀನ್‌ನ ವಿದ್ಯುದೀಯ ಸಮೀಕರಣವನ್ನು ಸಾಧಿಸಿರಿ.

    b) How do you determine the molar mass of macromolecules by Donnan - membrane method.

    ಡೊನ್‌ನ ಮೇಮರಿ ವಿಧಾನದಿಂದ ದೊಡ್ಡ ಅಣುಗಳ ಅಣುದ್ರವ್ಯರಾಶಿಯನ್ನು ಹೇಗೆ ಕಂಡುಹಿಡಿಯುವಿರಿ.

12. a) Give the conversion of aldopentose into aldohexose.

    ಆಲ್ಡೋಸ್ ಪೇಟೋಸ್‌ನ್ನು ಆಲ್ಡೋಸ್ ಹೆಹೋನ್‌ಗೆ ಪರಿವರ್ತಿಸುವುದನ್ನು ಬರೆಯಿರಿ.

    b) Give the experimental verification of de Broglie hypothesis by Davisson - Germer experiment.

    ಡೆವಿಸ್ಸನ್-ಜರ್ಮರ್ ಪ್ರಯೋಗದಿಂದ ಡಿಬ್ರಾಗ್ಲಿಯ ಸಿದ್ಧಾಂತವನ್ನು ಸಾಧಿಸುವ ಬಗ್ಗೆ ಕೊಡಿರಿ.

Reg. No.

VI Semester B.Sc. 4/3 Degree Examination, September - 2020
CHEMISTRY - II (Optional)
Paper-II (Regular / Repeater) (2014-15 Onwards)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

1) All questions are compulsory.

2) Answer all the questions in the same answer book.

3 Draw neat diagrams and give equations wherever necessary.

SECTION - A
ವಿಭಾಗ - ಅ

1. Answer **any ten** of the following.   (10×2=20)

ಕೆಳಗಿನವುಗಳಲ್ಲಿ ಯಾವುದಾದರೂ ಹತ್ತಕ್ಕೆ ಉತ್ತರಿಸಿರಿ.

a) Write the principle of chromatography.

ವರ್ಣ ವಿಶ್ಲೇಷಣೆಯಲ್ಲಿ ಅಡಗಿರುವ ಸಿದ್ಧಾಂತವನ್ನು ಬರೆಯಿರಿ.

b) Write any two applications of flame photometry.

ಜ್ವಾಲಾವರ್ಣ ಪ್ರಕಾಶಮಾಪಕದ ಎರಡು ಉಪಯೋಗಗಳನ್ನು ಬರೆಯಿರಿ.

c) Name the micro and macro nutrients present in the soil.

ಮಣ್ಣಿನಲ್ಲಿರುವ ಸೂಕ್ಷ್ಮ ಮತ್ತು ದೊಡ್ಡ (ಭಾರಿ) ಗಾತ್ರದ ಪೋಷಕಾಂಶಗಳನ್ನು ಹೆಸರಿಸಿರಿ.

d) State selection rule for d-d tranisions.

d-d ಪರಿವರ್ತನೆಯಲ್ಲಿ ಸೆಲೇಕ್ಷನ್ ನಿಯಮವನ್ನು ವಿವರಿಸಿ.

e) Give structure and one use of Paludrine.

ಒಂದು ಉಪಯೋಗ ಮತ್ತು ರಚನೆಯೊಂದಿಗೆ ಪಾಲುಡ್ರಿನ್ ಬನ್ಸಿಸಿ.

[P.T.O.

f) Write the reaction of Benzillic acid rearrangement.

ಬೇನಜಿಕ್ ಅಸಿಡ ಮರುಜೋಡಣೆ ಪ್ರತಿಕ್ರಿಯೆಯನ್ನು ಬರೆಯಿರಿ.

g) Mention one advantage and structure of TMS.

ಒಂದು ಅನುಕೂಲತೆಯೊಂದಿಗೆ TMS ನ ರಚನೆಯನ್ನು ಬರೆಯಿರಿ.

h) Write an example for cationic & anionic detergents.

ಒಂದು ಉದಾಹರಣೆಯೊಂದಿಗೆ ಕ್ಯಾಟ್ ಆಯಾನಿಕ್ ಮತ್ತು ಆನ್ ಆಯಾನಿಕ್ ನಿರ್ಮಕಾರಕ ವಸ್ತುಗಳನ್ನು ವಿವರಿಸಿ.

i) State Grothus-Draper Law.

ಗ್ರೊಥ್ಸ್ – ಡ್ರಾಪ್‌ರ್ ನಿಯಮವನ್ನು ವಿವರಿಸಿ.

j) What is Liquid - Liquid Junction potential ?

ಜಲ–ಜಲ ಸಂಗಮಿಸುವ ಸಾಮಥ್ಯರ್ತೆ ಎಂದರೇನು ?

k) What is photosensitization ? Give one example.

ಉದಾಹರಣೆಯೊಂದಿಗೆ ಪ್ರಕಾಶ ಸಂವೇದನೆಯನ್ನು ಬನ್ನಿಸಿ.

l) Calculate the value of Einstein energy for the radiation of wevelength 400nm.

ವಿಕಿರಣ ತರಂಗಾಂತರವು 400nm ಇದ್ದಾಗ ಐನ್‌ಸ್ಟಿನ್ ಶಕ್ತಿಯನ್ನು ಲೆಕ್ಕಿರಿ.

SECTION - B

ವಿಭಾಗ – ಬ

Answer **any four** of the following. (4×5=20)

ಕೇವಲ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ.

2. Give brief account of paper chromatography.

ಸಂಕ್ಷಿಪ್ತದಲ್ಲಿ ಕಾಗದ ವರ್ಣರೇಖನದ ಸಿದ್ಧಾಂತವನ್ನು ವಿವರಿಸಿ.

3. Explain the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complexion.

$[Ti(H_2O)_6]^{3+}$ ಕಾಂಪ್ಲೆಕ್ಸ ಆಯಾನಿನ್ ಎಲೆಕ್ಟ್ರಾನಿಕ್ ಸ್ಪೆಕ್ಟ್ರಮನ್ನು ವಿವರಿಸಿ.

4. Write one use and synthesis of Novacaine.

ಒಂದು ಉಪಯೋಗದೊಂದಿಗೆ ನೊವ್ಯಾಕ್ಯಾನ್'ನಿನ ಸಂಶ್ಲೇಷಣೆಯನ್ನು ಬರೆಯಿರಿ.

5. Explain the manufacture of soap by modern process with flow chart.

ಗತಿನಕ್ಷೆಯೊಂದಿಗೆ ಆಧುನಿಕ ಪ್ರಕ್ರಿಯೆಯಿಂದ ಸಾಬೂನ ತಯಾರಿಸುವ ರೀತಿಯನ್ನು ವಿವರಿಸಿ.

6. Write the reaction and mechanism of Benzidine Rearrangement.

ತಾಂತ್ರಿಕತೆಯ ವಿವರದೊಂದಿಗೆ ಬೇನಜಿಡಿನ್ ಪ್ರಿನರ್ ಹೊಂದಾಣಿಕೆಯನ್ನು ವಿವರಿಸಿ.

7. Write a note on acid base potentiometric titrations.

ಆಸಿಡ್ ಬೇಸ್ ಪೊಟೆನ್ಸ್ಯೋಮೇಟ್ರಿಕ್ ಟೈಟ್ರೀಕರಣದ ಮೇಲೆ ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.

SECTION - C

ವಿಭಾಗ – ಕ

Answer **any four** of the following.   (4×10=40)

ಕೇವಲ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ.

8. a) Using Brays & Olsins method how do you estimate phosphorous present in the soil ?

ಬ್ರೇಜ್ ಮತ್ತು ಓಲ್ಸನ್ ವಿಧಾನದಿಂದ ಮಣ್ಣಿನಲ್ಲಿರುವ ರಂಜಕವನ್ನು ಹೇಗೆ ಕಂಡುಹಿಡಿಯುವಿರಿ.

b) How the element sodium is determined by flame photometery ?

ಜ್ವಾಲಾವರ್ಣ ಪ್ರಕಾಶ ಪದ್ಧತಿಯಿಂದ ಸೋಡಿಯಂ ಪರಿಮಾಪನ ಹೇಗೆ ಮಾಡುವಿರಿ.

9. a) Explain the following.

(i) Nuclear shielding and deshielding

(ii) Spin-Spin-Coupling

ಕೆಳಗಿನವುಗಳನ್ನು ವಿವರಿಸಿ.

(i) ಪರಮಾಣು ಶೀಲ್ಡಿಂಗ್ ಮತ್ತು ಡಿಶೀಲ್ಡಿಂಗ್

(ii) ಸ್ಪಿನ್-ಸ್ಪಿನ್ ಕಪಲಿಂಗ್

b) Write the reaction and mechanism of Favorski rearrangement.

ಫೆವರಸ್ಕಿ ಹೊಂದಾಣಿಕೆ ಪ್ರತಿಕ್ರಿಯೆಯನ್ನು ತಾಂತ್ರಿಕತೆಯ ವಿವರದೊಂದಿಗೆ ವಿವರಿಸಿ.

[P.T.O.

10. a) Define emf of a cell. Describe how emf is measured by potentiometrically.

ಕೋಶದ ಈ.ಎಂ.ಎಫ್. ವ್ಯಾಖ್ಯಾನಿಸಿ. ಪೊಟೆನ್ಸಿಯೋಮೆಟ್ರಿಕ್ ವಿಧಾನದಿಂದ ಈ.ಎಂ.ಎಫ್. ಅಳೆಯುವ ವಿಧಾನವನ್ನು ವಿವರಿಸಿ.

b) How is the pH of a solution determined experimently by using quinhydron electrode.

ಕ್ವಿನ್ ಹೈಡ್ರೋನ್ ವಿದ್ಯುದ್ದಾರ ಉಪಯೋಗಿಸಿ ದ್ರಾವಣದ pH ನ್ನು ಹೇಗೆ ಕಂಡುಹಿಡಿಯುವಿರಿ.

11. a) Write a note on Calomel electrode.

ಕೆಲೋಮಲ್ ವಿದ್ಯುದ್ದಾರದ ಬಗ್ಗೆ ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.

b) Explain PMR spectra of the following compounds.

(i) Benxine (ii) Ethylbromide

ಕೆಳಗಿನ ಸಂಯುಕ್ತಗಳ PMR ಸ್ಪೆಕ್ಟಗಳನ್ನು ವಿವರಿಸಿ.

(i) ಬೆಂಜೀನ್ (ii) ಈಥೈಲ್ ಬ್ರೊಮೈಡ್

12. a) Give synthesis and one use of Novalgin.

ಸ್ನೋವಾಲಜಿನ್‌ನ ಸಂಶ್ಲೇಷಣೆಯನ್ನು ಬನ್ನಿಸಿ ಒಂದು ಉಪಯೋಗವನ್ನು ಬರೆಯಿರಿ.

b) (i) What are para pharmaceutical reagents ? Write the composition and one use of Benedicts reagent.

(ii) Write the principle involved in Electrogravimetory.

Reg. No. [ ][ ][ ][ ][ ][ ][ ][ ]

VI Semester B.Sc. 3 Degree Examination, September - 2020

COMPUTER SCIENCE (Optional)

Paper - I

(Repeater)

Time : 3 Hours
Maximum Marks : 80

Instructions to Candidates:

   1)   Answer ALL sections.

   2)   Draw neat diagram wherever necessary.

SECTION - A

I.   Answer any **TEN** of the following.   (10×2=20)

   1.   Define computer network.

   2.   Define Topology? Mention any two names.

   3.   Mention two uses of data link layer.

   4.   What is protocol?

   5.   What is LAN?

   6.   Define packet.

   7.   Write abbrevations of WWW and DNS.

   8.   What is token?

   9.   What is flooding?

   10.   Define congestion.

   11.   Mention two services of Network Layer.

   12.   What is electronic mailing?

[P.T.O.

SECTION - B

II. Answer any **FOUR** of the following : (4×5=20)

13. Explain TCP/IP model.

14. Explain Twisted - pair and co-axial cables.

15. What is Hamming code? Elaborate with example.

16. Explain Bluetooth in detail.

17. Explain Transport Layer and Application layer services.

18. Explain wireless LAN

19. Explain World Wide Web in detail.

SECTION - C

III. Answer any **FOUR** of the following. (4×10=40)

20. Define switching? Explain circuit switching and packet switching.

21. Explain OSI reference model with neat diagram.

22. Define error detection and error - correction method? Explain CRC method for error detection.

23. Define ALOHA? Explain types of ALOHA.

24. Explain Leacky Bucket and token bucket.

25. a) Explain TCP protocol in detail (5)

    b) Explain Elements of Transport protocols. (5)

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VI Semester B.Sc. 3 Degree Examination, September -2020

COMPUTER SCIENCE (OPTIONAL)

Paper -II : Core Java

(Repeater)

Time : 3 Hours   **Maximum Marks : 80**

Instructions to Candidates:

    1.   Answer All Sections.

    2.   Draw neat diagram wherever necessary.

SECTION -A

Answer any **Ten** questions of the following.   **(10×2=20)**

1.   Define JAVA.

2.   Define Constant and Variable.

3.   What is class and object?

4.   What is Inheritance?

5.   Define package.

6.   What are Threads in Java?

7.   Define Interface.

8.   What is HTML?

9.   Define Applet.

10.   Mention types of Loops used in JAVA.

11.   Mention any four data types of JAVA?

12.   Define Stream Class.

P.T.O.

SECTION-B

Answer any **Four** questions of the following. (4×5=20)

13. How JAVA differs from C++?

14. Explain while and do statements with example.

15. Explain constructors with example.

16. Explain method overloading with example.

17. Explain API package and its uses.

18. Explain types of errors.

19. Explain try, catch and Finally with simple program.

SECTION-C

Answer any **Four of the following.** (4×10=40)

20. Explain if ....else, else if, Nesting if with examples.

21. Define Array. Explain types of array with example program.

22. a) Write a JAVA program to demonstrate Lines and Rectangles using Applets. (5)

     b) Explain Applet life cycle. (5)

23. a) Explain Concept of Streams. (5)

     b) Explain HTML Tags. give example. (5)

24. a) Explain creating file, reading and writing file in JAVA. (5)

     b) Explain any four oops concepts. (5)

25. Explain creating threads, extending Thread methods and thread priority.

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VI Semester B.Sc. 3/B.Sc. 4 Degree Examination, September - 2020
MATHEMATICS (Optional)
Paper : I - Differential Equations
(Regular and Repeaters w.e.f. 2016-17)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :   Answer All Parts.

PART - A

Answer any Ten of the following :   (10×2=20)

1. a) Solve for y, $\dfrac{dx}{dt} + y = 0$; $\dfrac{dy}{dt} + x = 0$.

    b) Solve $dx = \dfrac{dy}{3} = \dfrac{dz}{5z + \tan(y - 3x)}$.

    c) Test the condition for integrability of $yzdx - 2xzdy + (xy\text{-}zy^3)dz = 0$.

    d) Define Singular Point and Regular Singular Point of Ordinary Differential Equation of the Second Order.

    e) Determine whether $x = 0$ is an Ordinary Point or Singular Point of $2x^2y'' - xy' + (x\text{-}5)y = 0$.

    f) Show that $x^4 = \dfrac{1}{35}\left[8P_4(x) + 20P_2(x) + 7P_0(x)\right]$.

    g) Prove that $P_n(-1) = (-1)^n$.

    h) Form the Partial Differential Equation by eliminating an arbitrary constants from $z = (x^2 + a)\,(y^2 + b)$.

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i) Find singular integral of $z = px + qy - 2\sqrt{pq}$.

j) Find the Complete Integral of $q = e^{-p/a}$.

k) Solve $\dfrac{\partial^2 z}{\partial x^2} - \dfrac{\partial^2 z}{\partial x \partial y} - 12 \dfrac{\partial^2 z}{\partial y^2} = 0$.

l) Find the Particular Integral of $(D^2 - a^2 D'^2)z = x$

PART - B

Answer any Four of the following : $\qquad$ (4×5=20)

2. Solve $\dfrac{dx}{dt} + \dfrac{dy}{dt} + 2x + y = 0;\quad \dfrac{dy}{dt} + 5x + 3y = 0$.

3. Solve $\dfrac{x\,dx}{z^2 - 2yz - y^2} = \dfrac{dy}{y + z} = \dfrac{dz}{y - z}$.

4. Find the Power Series Solution of $(2 + x^2)y'' + xy' - (1 + x)y = 0$ about $x = 0$

5. Prove that $nP_n = (2n - 1)xP_{n-1} - (n-1)P_{n-2}, \ \forall n \geq 2$

6. Find Complete Integral of $z(p^2 - q^2) = x - y$.

7. Solve $(D^2 - 2DD' + D'^2)z = \tan(x + y)$.

PART - C

Answer any Four of the following : $\qquad$ (4×10=40)

8. a) Obtain the condition for integrability of the equation $Pdx + Qdy + Rdz = 0$, where P, Q, R are function of x, y, z.

   b) Solve $(y^2 + z^2 - x^2)dx - 2xy\,dy - 2xz\,dz = 0$.

9. a) Find Power Series Solution of $y'' + xy = 0$ about $x = 0$.

   b) Solve in Series $x(x - 1)y'' + (3x - 1)y' + y = 0$ by Frobenius Method.

10. a) Prove that $(1 - 2xz + z^2)^{-\frac{1}{2}} = \sum_{n=0}^{\infty} z^n P_n(x)$.

b) Prove that $\int_{-1}^{1} P_m(x) P_n(x) dx = 0$, if $m \neq n$.

11. a) Derive the Partial Differential Equation in the form of $P_p + Q_q = R$ by eliminating an arbitrary function ϕ from $\phi(u, v) = 0$, where u, v are function of x, y, z

b) Solve $x(y^2 - z^2) p - y(z^2 + x^2) q = z(x^2 + y^2)$.

12. a) Explain Charpit's Method of solving the Partial Differential Equation

$F(x, y, z, p, q) = 0$.

b) Solve by Charpit's Method $pxy + pq + qy = yz$.

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VI Semester B.Sc. 3 / B.Sc. 4 Degree Examination, September - 2020

MATHEMATICS

(Regular and Repeater 2016-2017)

Complex Analysis and Ring Theory

Paper : II

(Optional)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

    1)   Question Paper has 3 Parts Namely A,B and C.

    2)   Answer All Parts.

PART - A

1. Answer any **ten** of the following.(Two marks each)   (10×2=20)

    a)   Prove that an analytic function with constant real part is constant.

    b)   Show that the function $f(z) = z(\text{Im}\, z)$ is not analytic

    c)   Prove that $\frac{1}{2}\log(x^2 + y^2)$ is harmonic.

    d)   Evaluate $\int_C \frac{dz}{z-2}$ around the circle $|z-2| = 4$

    e)   State 'Morere's theorem'.

    f)   Define :

        i)   Simple pole

        ii)   Essential singularity.

    g)   State 'Laurent's theorem'.

    h)   Prove that the poles of an analytic function are isolated.

    i)   Find the residue of $f(z) = \frac{2z+3}{(z-1)(z-2)}$ at $z = 2$.

    j)   Define a 'Sub ring' and give an example.

    k)   Define 'Principal' and 'Maximal ideals'.

    l)   In a ring $(R, +, \cdot)$ prove that $a.0=0$ $\forall a \in R$ and 0 is the identity element w.r.t +

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PART - B

Answer any **four** of the following (Five marks each) (4×5=20)

2. State and prove necessary condition for a function $f(z)$ to be analytic.

3. Prove that $(x-1)^3 - 3xy^2 + 3y^2$ is harmonic find the harmonic conjugate.

4. State and prove 'Liouville's theorem'.

5. If $f(z)$ has a pole of order m at $z = a$, then show that

$$\operatorname{Re}s\{f(z):a\} = \lim_{z \to a}\left\{\frac{1}{(m-1)!}\frac{d^{m-1}}{dz^{m-1}}\left[(z-a)^m f(z)\right]\right\}$$

6. Using contour integration, prove that $\displaystyle\int_0^{2\pi} \frac{d\theta}{5 + 3\cos\theta} = \frac{\pi}{2}$

7. Show that the set $z\left(\sqrt{2}\right) = \left\{a + b\sqrt{2} : a, b \in z\right\}$ is a ring w.r.t usual addition and multiplication.

PART - C

Answer any **four** of the following (Ten marks each) (4×10=40)

8. a) Prove that an analytic function with constant modulus is constant.

   b) If $f(z) = u + iv$ is an analytic function of $z=x+iy$ and ψ is any function of z with derivatives of first and second order exists, then prove that

   $$\left[\frac{\partial\psi}{\partial x}\right]^2 + \left[\frac{\partial\psi}{\partial y}\right]^2 = \left\{\left[\frac{\partial\psi}{\partial u}\right]^2 + \left[\frac{\partial\psi}{\partial v}\right]^2\right\} \left|f'(z)\right|^2$$

9. a) State and prove 'Cauchy's integral theorem'.

   b) Evaluate $\displaystyle\int_C \frac{dz}{(z-1)(z+3)}$ where C is $|z| = 1$, using Cauchy's integral theorem.

10. a) State and prove 'Taylor's theorem'.

    b) Expand $f(z) = \dfrac{1}{z(z^2 - 3z + 2)}$ in a Laurent's series for the regions

i) $0 < |z| < 1$

ii) $1 < |z| < 2$

11. a) State and prove 'Cauchy's residue theorem'.

    b) Prove that $\displaystyle\int_0^\infty \frac{dx}{\left(1+x^2\right)^2} = \frac{\pi}{4}$

12. a) Define homomorphism of two rings If $f : R \to R'$ is a homomorphism from the ring R into R'. then prove that (i) $f(0) = 0'$ where 0 and $0'$ are the zeros of R and R' respectively (ii) $f(-a) = -f(a) \forall a \in R$.

    b) Prove that the set $G = \{0,1,2,3,4\}$ is an integral domain w.r.t addition and multiplication modulo 5.

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VI Semester B.Sc.3./B.Sc.4. Degree Examination, September - 2020
MATHEMATICS (Optional)
(RCU Fresh and Repeaters New Syllabus w.e.from 2016-17)
Paper - III : Topology and Laplace Transforms

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer all parts.

PART - A

1. Answer any **Ten** of the following. (2 marks each). (10×2=20)

   a) Show that indiscreate and discreate topologies on a set x are comparable.

   b) Prove that every open interval is an open set in the real space (Ru).

   c) If X = {1,2,3} and $J = \{x, \phi, \{2\} \{1\ 3\}\}$ show that the set {2,3} is the neighbourhood of the point 2.

   d) Define Heriditary property.

   e) Define base and sub - base for Topology.

   f) Prove that L[af(t)+bg(t)] = a L[f(t)]+b L[g(t)] if a and b are constants.

   g) Find L(sin3t.cos4t).

   h) State and prove change of scale property.

   i) Evaluate $L^{-1}\left(\dfrac{1}{(s-4)^3}\right)$.

   j) Find $L\left(\dfrac{\cos t}{t}\right)$.

   k) Solve $y' + y = 0$ given y(0) = 1.

   l) Define Dirac - Delta function and find $L\{\delta(t-a)\}$.

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PART - B

Answer any **Four** of the following. (4×5=20)

2. In a topological space (X,J) if $A, B \subset X$ then prove that

   i) If $A \subset B$ then $\overline{A} \subset \overline{B}$

   ii) $\overline{A \cup B} = \overline{A} \cup \overline{B}$

3. Let (XJ) be a topological space and $Y \subset X$ Define $J_y = \{Y \cap G / G \in J\}$ then prove that J_y is a topology on Y.

4. Find the Laplace transform of the function $f(t) = \begin{cases} e^t & for \ \ 0 < t < 5 \\ 3 & for \ \ t > 5 \end{cases}$

5. If f(t) is a periodic function of period T>0 then prove that $L\{f(t)\} = \dfrac{1}{1-e^{-sT}} \int_0^T e^{-st}.f(t)dt$.

6. Prove that $\int_0^\infty t.e^{-2t}.\sin t.dt = 4/25$.

7. If $L\{f(t)\} = F(s)$ then prove that $L[f^n(t)] = S^n F(s) - S^{n-1}f(0) - S^{n-2}f^1(0)....f^{n-1}(0)$.

PART - C

Answer any **Four** of the following. (4×10=40)

8. a) Let A and B are two sets in a topological space (XJ), then prove that $d(A \cup B) = d(A) \cup d(B)$.

   b) Let $X = \{1,2,3,4\}$ and $A = \{1,3,4\} \subset X$ and $J = \{X, \phi\{1,2\}, \{2\}, \{2,4\}\{1,2,3\}\{1,2,4\}\}$ be a topology on X then find

      i) A^o (ii) $(A^o)'$

9. a) Define T_2 - space prove that every subspace of T_2 - space is T_2 - space.

   b) If $X = \{a \ b \ c \ d\}$. $J = \{x, \phi, \{a\}\{ab\}\{a,b,c\}\}$ then find the

      i) Closure of the set {b,c}

      ii) Derived set of {a,c}

10. a) If $L[f(t)] = F(s)$, then prove that $L\{t^n f(t)\} = (-1)^n \cdot \dfrac{d^n}{ds^n}(F(s))$.

    b) Find $L\{f(t)\}$ where $f(t) = [\cosh 4t . \sin 3t]$.

11. a) Prove that $L[t^n] = \dfrac{n!}{s^{n+1}}$ where n is positive integer.

    b) Find $L\left[\dfrac{\cos at - \cos bt}{t}\right]$

12. a) State and prove convolution theorem.

    b) Using convolution theorem find the $L^{-1}\left[\dfrac{1}{(s+2)(s+4)}\right]$.

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VI Semester B.Sc. 4 Degree Examination, September – 2020

PHYSICS (OPTIONAL)

(Regular)

Paper : I

Time : 3 Hours   **Maximum Marks : 80**

Instructions to Candidates:

    1)   Calculators may be allowed for solving problems.

    2)   Write intermediate steps clearly.

    3)   Give physical meanings for symbols and notations.

PART-I

Answer any **TEN** questions :   (10×2=20)

1.   a)   State Bragg's law of diffraction.

    b)   What is orthorhombic crystal system?

    c)   What is isotope effect ?

    d)   Write any two applications of super conductors.

    e)   State wiedemann - Franz law.

    f)   What is β - decay ?

    g)   Mention two merits of liquid drop model.

    h)   Define solar constant.

    i)   Write two advantages and disadvantages of wind energy.

    j)   A crystal plane produces intercepts 4a, b and 2c on X, Y and Z axes respectively. Find the miller indices.

    k)   In a linear accelerator proton is accelerated by a potential of 60 KV and leaves the tube. Calculate the velocity of proton if the ratio $\dfrac{e}{m} = 9.578 \times 10^7$ C/Kg for proton.

    l)   The zenith angle at a given point on the earth surface is $27^0\,30'$. Find the altitude angle at that point of the plane.

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PART - II

Answer any **FOUR** questions: (4×5=20)

2. Give construction & working of Bragg's x - ray spectrometer.

3. What is α -decay ? Explain Range & Energy of α -particles.

4. Write a note on solar radiations at earths surface.

5. A copper wire of diameter 0.3 mm and length 0.5m has the resistance of 0.12 Ω at 20°C. If the experimental value of Lorentz number for copper is 2.27 ×10⁻⁸ W Ω K⁻² then find the thermal conductivity of the copper at 20°C.

6. Prove the Boolean Identity

   $(A+B)(A+C)=A+BC$

7. In a cyclotron, deuterons of mass 3.3454 ×10⁻²⁷ kg describe a circle of radius 0.3 m before emerging from the Dees. The frequency of the applied e.m.f is 8 MHz. Find the flux density of the magnetic field.

PART - III

Answer any **FOUR** questions : (4×10=40)

8. Give the Debye's theory of specific heat capacity of a solid.

9. What is intrinsic semiconductor? Derive expression for electrical conductivity in case of intrinsic semiconductor.

10. Explain in detail weizsacker semi-empirical mass formula of a nucleus.

11. Give an account of different conventional energy sources.

12. Give in detail classification of conducting polymers.

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VI Semester B.Sc. 3 Degree Examination, September –2020

PHYSICS (Optional)

(Repeater)

Paper : I

Time : 3 Hours   **Maximum Marks : 80**

Instructions to Candidates:

    1.   Use Calculators for calculations.

    2.   Write Intermediate Steps.

    3.   Give physical meaning for Symbols and notations.

PART-I

Answer any **ten** questions of the following . .   **(10×2=20)**

1.   a)   Define unit cell.

    b)   Name any two Crystal Systems.

    c)   Give any two applications of superconductors.

    d)   Mention any two properties of metals.

    e)   Write semi-empirical mass formula with notations.

    f)   Write any two properties of beta rays.

    g)   What are conventional energy sources?

    h)   Write the truth table of NOR gate.

    i)   Mention any two advantages of solar energy.

    j)   Define Hall effect.

    k)   Define intrinsic Semiconductor.

    l)   A crystal plane produces 4a, b & 2c on x, y & z axes respectively. Calculate Miller indices.

P.T.O.

PART-II

Answer any **four** questions of the following: (4×5=20)

2. Derive an expression for interplanar spacing in case of cubic crystals.

3. Explain nuclear fission on the basis of liquid drop model.

4. Discuss failures of classical free electron theory of metals.

5. Discuss non-conventional energy sources.

6. Convert:

    a)   Decimal to hexadecimal - $188_{(10)}$

    b)   Decimal to binary - $3.47_{(10)}$

7. Show that in linear accelerator length of the cylinders are in the ratio

$$l_1 : l_2 : l_3 : ...... = 1 : \sqrt{2} : \sqrt{3} : ......$$

PART-III

Answer any **four** questions of the following :   (4×10=40)

8. Describe construction, working and theory of cyclotron.

9. Derive expression for electrical and thermal conductivity. Hence deduce weidman-Franz Law.

10. Describe construction and working of Bragg's X-ray Spectrometer. Hence derive Bragg's Law.

11. Define Solar constant. Describe Angstrom's Compensation pyrheliometer.

12. What are liquid crystals? Discuss the classification of liquid crystals.

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VI Semester B.Sc. 4 Degree Examination, September - 2020
PHYSICS (Optional)
(Regular)
Paper : II

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

1) Use calculators for calculations.

2) Write intermediate steps.

3) Give physical meaning for symbols and notations.

PART- I

1. **Answer any Ten of the following :**   (10×2=20)

   a) What do you mean by Laplace transform ?

   b) Find the Fourier transform of $\frac{1}{t}$

   c) What is LED ? Write its circuit symbol.

   d) Define responsivity and write its unit.

   e) What are constants ? Name the types of constants.

   f) Write a C- program to print "Good Morning".

   g) Define skip distance.

   h) Define flow chart. Write a flow chart to check whether the given year is leap year.

   i) Draw a neat schematic symbol of op-amp and mention the terminals.

   j) Mention any two uses of IC-555

   k) Calculate the modulation index of FM carrier wave having a carrier swing of 400 KHz and modulating signal of 10 KHz_____

   l) Calculate the numerical aperture and acceptance angle for a fiber cable of which $\eta_{core} = 1.5$ and $\eta_{cladding} = 1.48$. The lanching takes place from air.
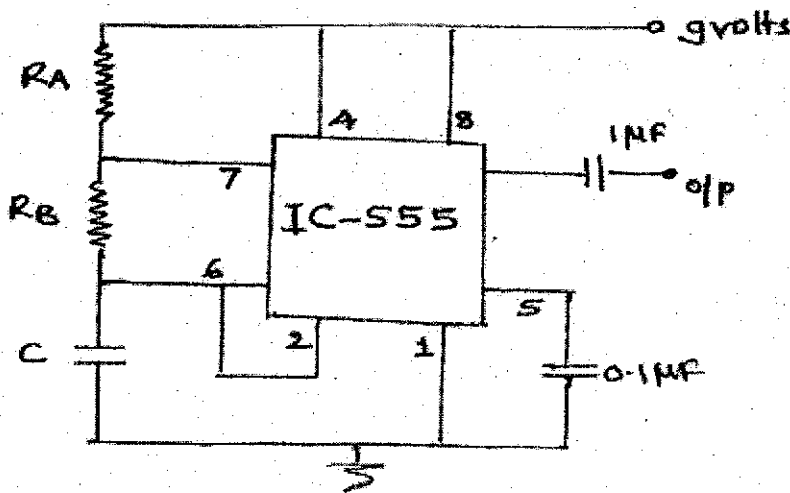
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PART - II

Answer any Four of the following : (4×5=20)

2. Find the Fourier sine and cosine transform of $f(t) = e^{-at}$

3. Distinguish between step index and graded index fiber.

4. State and explain secant law.

5. Explain the following terms.

   a) Print $f(\ )$ function.

   b) Scan $f(\ )$ function

6. An audio signal of 1KHz is used to modulate a carrier of 500 KHz

   Find :   i)   Side band frequencies

             ii) Band width.

7. Determine the frequency and percentage of duty cycle of the circuit shown below. Given that $R_A = 3k\Omega$, $R_B = 2.7k\Omega$ and $C = 0.033\mu F$.

PART - III

Answer any Four of the following : (4×10=40)

8. State and explain the basic properties of Laplace transforms.

9. Classify optical fiber based on refractive index profile. Hence describe them with typical core and cladding diameter, refractive index profile and mode propogation sketches.

10. a) Explain basic structure of C - program.

    b) What are C - tokens explain ?

11. a) What is frequency modulation ?

    b) Derive an expression for frequency modulation.

12. a) What are the ideal properties of an op-amp ?

    b) What is open loop op-amp configuration ?

    Hence describe differential amplifier configuration.

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VI Semester B.Sc. 3 Degree Examination, September - 2020
PHYSICS (Optional)
PAPER : II
(Repeater)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

   1)   Use Calculators for Calculations.

   2)   Write intermediate steps.

   3)   Give physical meaning for symbols and notations.

PART - I

1.   Answer **any ten** questions.   (10×2=20)

   a.   State the linear property of Fourier transform.

   b.   Find the Laplace transform of sin2t. sin3t.

   c.   What is optocoupler?

   d.   Give any two applications of optical fiber.

   e.   What is demodulation?

   f.   Mention any two uses of integrated circuits (IC).

   g.   What is flowchart?

   h.   Name any two tokens used in C-language.

   i.   Define secant law.

   j.   Define modulation factor.

   k.   Calculate the modulation index for an FM Wave. Where the maximum frequency deviation is 50 KHz and the modulating frequency is 5 KHz.
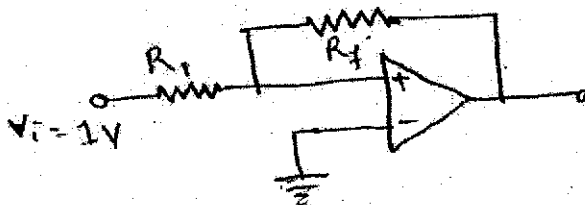
   l.   Define multivibrator.

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PART - II

Answer any **four** of the following. (4×5=20)

2. Establish the relation between Fourier and Laplace transform

3. Distinguish between amplitude modulation and frequency modulation.

4. Explain characteristics of ideal op-amp.

5. Write a C-program to find LCM of two numbers.

6. Calculate the critical angle and acceptance angle of a given optical fiber if the refractive indices of the core and the cladding are 1.563 and 1.498 respectively.

7. Calculate the output voltage and gain of inverting amplifier for values R_f=500 KΩ, R_1=100KΩ and V_i=1v.

PART - III

Answer any **four** of the following. (4×10=40)

8. **a)** Discuss the difference between Laplace and Fourier transform.

   b) Find the inverse Laplace transform of $\dfrac{s^2 - 3s + 4}{s^3}$

9. **a)** Explain the construction and working of photodiode.

   b) Explain VI Characteristics of photodiode and its applications.

10. Explain sky wave and groung wave propagation.

11. **a)** Draw the block diagram of operational amplifier and explain the function of each block.

   b) With neat circuit diagram, explain the working of a phase shift oscillator using op-amp.

12. **a)** Explain the basic structure of C-programme.

   b) Explain while statement and for statement with syntax.