Reg. No.

IV Semester B.Sc.3/B.Sc.4 Degree Examination, September - 2020
CHEMISTRY(Optional)
(Repeater/Regular from 2018-19)

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

Instructions to Candidates:

1)   All Sections are compulsory.

ಎಲ್ಲಾ ವಿಭಾಗಗಳು ಕಡ್ಡಾಯವಾಗಿವೆ.

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

ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳನ್ನು ಒಂದೇ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆಯಿರಿ.

3)   Draw neat diagrams and give equations wherever necessary.

ಆವಶ್ಯವಿದ್ದಲ್ಲಿ ಅಂದವಾದ ಚಿತ್ರಗಳನ್ನು ಮತ್ತು ಸಮೀಕರಣಗಳನ್ನು ಬರೆಯಿರಿ.

SECTION - A
ವಿಭಾಗ – ಎ

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

ಬೇಕಾದ ಹತ್ತು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿರಿ.

1.   a)   What is ferromagnetism ? Give an example.

ಫೆರೋಮೆಗ್ನೆಟಿಸಂ ಅಂದರೇನು ? ಒಂದು ಉದಾಹರಣೆ ಕೊಡಿ.

   b)   Define solubility product.

ಸೊಲುಬಿಲಿಟಿ ಪ್ರೊಡಕ್ಟನ್ನು ವ್ಯಾಖ್ಯಾನಿಸಿರಿ.

   c)   Write the general electronic configuration of d - block and f - block elements.

d - ಬ್ಲಾಕ್ ಮತ್ತು f - ಬ್ಲಾಕ್ ಮೂಲವಸ್ತುಗಳ ಸಾಮಾನ್ಯ ಎಲೆಕ್ಟ್ರಾನ್ ವಿನ್ಯಾಸ ಬರೆಯಿರಿ.

   d)   Define ionic mobility.

ಆಯಾನಿಕ್ ಮೋಬಿಲಿಟಿಯನ್ನು ವ್ಯಾಖ್ಯಾನಿಸಿ.

   e)   Name any four trace elements present in human body.

ಮಾನವನ ದೇಹದಲ್ಲಿರುವ ಯಾವುದೇ ನಾಲ್ಕು ಅಲ್ಪ ಪ್ರಮಾಣದ ಮೂಲವಸ್ತುಗಳನ್ನು ಹೆಸರಿಸಿ.

   f)   What is probability factor ?

ಪ್ರೊಬಾಬಿಲಿಟಿ ಫ್ಯಾಕ್ಟರ್ ಅಂದರೇನು ?

[P.T.O.

g) Name any two pollutants present in air and their adverse effect on environment.

ಗಾಳಿಯಲ್ಲಿರುವ ಯಾವುದೇ ಎರಡು ಮಾಲಿನ್ಯಕಾರಕಗಳನ್ನು ಮತ್ತು ಅವುಗಳ ದುಷ್ಪರಿಣಾಮವನ್ನು ಹೆಸರಿಸಿ.

h) What are parallel reactions ? Give an example.

ಪ್ಯಾರಲೆಲ್ ಪ್ರತಿಕ್ರಿಯೆಗಳೆಂದರೇನು ? ಒಂದು ಉದಾಹರಣೆ ಕೊಡಿ.

i) What type of aldehydes undergo Cannizzaro's reaction ? Give one example.

ಯಾವ ಪ್ರಕಾರದ ಅಲ್ಡಿಹೈಡ್‌ಗಳು ಕ್ಯಾನಿಝ್ಝುರೋ ಕ್ರಿಯೆಗೆ ಒಳಪಡುತ್ತವೆ ? ಒಂದು ಉದಾಹರಣೆ ಕೊಡಿ.

j) Give Hell-Volhard-Zelinsky(H-V-Z) reaction with an example.

ಒಂದು ಉದಾಹರಣೆಯೊಂದಿಗೆ ಹೆಲ್‌–ವೋಲ್ಹಾರ್ಡ್‌–ಝುಲಿನಸ್ಕಿ (H-V-Z) ರಾಸಾಯನಿಕ ಕ್ರಿಯೆಯನ್ನು ನೀಡಿರಿ.

k) What are epoxides ? Give an example.

ಇಪಾಕ್ಸೈಡ್ಸ್ ಅಂದರೇನು ? ಒಂದು ಉದಾಹರಣೆ ಕೊಡಿರಿ.

l) Why CH_3NH_2 is more basic than $C_6H_5NH_2$?

CH_3NH_2 ಸಂಯುಕ್ತವು $C_6H_5NH_2$ ಗಿಂತ ಹೆಚ್ಚು ಪ್ರತ್ಯಾಮ್ಲಿಯವಾಗಿದೆ ಏಕೆ ?

SECTION - B

ವಿಭಾಗ – ಬಿ

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

ಬೇಕಾದ ನಾಲ್ಕಕ್ಕೆ ಉತ್ತರಿಸಿ.

2. What are transition elements ? Explain catalytic property of transition elements giving examples.

ಟ್ರಾನ್ಸಿಶನ್ ಮೂಲವಸ್ತುಗಳೆಂದರೇನು ? ಟ್ರಾನ್ಸಿಶನ್ ಮೂಲವಸ್ತುಗಳ ವೇಗವರ್ಧಕ ಗುಣಧರ್ಮಗಳನ್ನು ಉದಾಹರಣೆಗಳೊಂದಿಗೆ ವಿವರಿಸಿ.

3. Describe the structure and function of hemoglobin.

ಹೆಮೋಗ್ಲೋಬಿನ್‌ನ ರಚನೆ ಹಾಗೂ ಕಾರ್ಯಗಳನ್ನು ವಿವರಿಸಿರಿ.

4. Explain the mechanism of Perkin's reaction.

ಪರ್ಕಿನ್ಸ್ ರಾಸಾಯನಿಕ ಕ್ರಿಯೆಯ ಕ್ರಿಯಾತಾಂತ್ರಿಕತೆಯನ್ನು ವಿವರಿಸಿರಿ.

5. What is Saponification ? Describe $B_{AC}2$ mechanism of hydrolysis of an ester.

ಸೆಪಾನಿಫಿಕೇಶನ್ ಅಂದರೇನು ? ಎಸ್ಟರ್ಸ್‌ನ ಜಲವಿಭಜನೆಯ $B_{AC}2$ ಕ್ರಿಯಾತಾಂತ್ರಿಕತೆಯನ್ನು ವಿವರಿಸಿರಿ.

6. What is order of reaction ? Describe differential equation method of determination of order of a reaction.

ರಾಸಾಯನಿಕ ಕ್ರಿಯೆಯ ಆರ್ಡರ್ ಎಂದರೇನು ? ಡಿಫರೆನ್ಸಿಯಲ್ ಸಮೀಕರಣ ಪದ್ಧತಿಯಿಂದ ಕ್ರಿಯೆಯ ಆರ್ಡರ್ ಕಂಡುಹಿಡಿಯುವುದನ್ನು ವಿವರಿಸಿರಿ.

7. Derive an expression for the rate constant of opposing reactions.

ಅಪ್ಪೋಜಿಂಗ್ ಪ್ರತಿಕ್ರಿಯೆಯು ವೇಗ ಸ್ಥಿರಾಂಕವನ್ನು ನಿರೂಪಿಸಿರಿ.

SECTION - C

ವಿಭಾಗ – ಸಿ

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

ಬೇಕಾದ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿರಿ.

8. a) Write a note on general properties of f-block elements.

ಎಫ್ - ಬ್ಲಾಕ್ ಮೂಲವಸ್ತುಗಳ ಸಾಮಾನ್ಯ ಗುಣಧರ್ಮಗಳನ್ನು ಕುರಿತು ಒಂದು ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.

   b) Describe the treatment of Sewage Water.

ಚರಂಡಿ ನೀರಿನ ಪರಿಷ್ಕರಣೆಯನ್ನು ವಿವರಿಸಿರಿ.

9. a) What is Hoffman's rearrangement ? Describe its mechanism.

ಹಾಫ್‌ಮನ್‌ನ ಪುನರ್‌ವಿನ್ಯಾಸ ಎಂದರೇನು ? ಈ ಕ್ರಿಯೆಯ ಕ್ರಿಯಾತಾಂತ್ರಿಕತೆಯನ್ನು ವಿವರಿಸಿರಿ.

   b) What is Curtius rearrangement ? Explain.

ಕರ್ಟಿಯಸ್ ಪುನರ್‌ವಿನ್ಯಾಸ ಅಂದರೇನು ? ವಿವರಿಸಿರಿ.

10. a) How do you determine the transport number by Hittorf's Method ?

ಹಿಟರೊಪ್ಸ್ ವಿಧಾನದಿಂದ ಟ್ರಾನ್ಸ್‌ಪೋರ್ಟ್ ನಂಬರನ್ನು ಹೇಗೆ ಕಂಡುಹಿಡಿಯುವಿರಿ ?

   b) In a second order reaction, the initial concentration of a reactant is 2M. Its half life is 30 min. What is the concentration of the reactant after 60 min ? If the concentration both reactants is same initially (a=b).

ಸೆಕೆಂಡ್ ಆರ್ಡರ್ ಕ್ರಿಯೆಯಲ್ಲಿ (a=b) ಇದ್ದಾಗ, ಆರಂಭದಲ್ಲಿ ಕ್ರಿಯಾಕಾರಿಗಳ ಪ್ರಬಲತೆ 2M ಅವುಗಳ ಅರ್ಧ ಆಯಸ್ಸು 30 ಮಿನಿಟ್. 60 ಮಿನಿಟ್‌ಗಳ ನಂತರ ಕ್ರಿಯಾಕಾರಕಗಳ ಪ್ರಬಲತೆ ಎಷ್ಟು.

11. a) Explain the mechanism of Claisen Schmidt reaction.

ಕ್ಲೇಜನ್ –ಸ್ಮಿಡ್ಟ್ ಪ್ರತಿಕ್ರಿಯೆಯ ಕ್ರಿಯಾತಾಂತ್ರಿಕತೆಯನ್ನು ವಿವರಿಸಿರಿ.

   b) What are crown ethers ? Explain the properties of erown ethers as phase transfer catalysts.

ಕ್ರೌನ್ ಈಥರಗಳು ಯಾವುವು ? ಇವುಗಳನ್ನು ಫೇಸ್ ಟ್ರಾನ್ಸ್‌ಫರ್ ವೇಗವರ್ಧಕಗಳಾಗಿ ಹೇಗೆ ಉಪಯೋಗಿಸಬಹುದು ? ವಿವರಿಸಿರಿ.

12. a) What are the sources of SO_x ? What are the effects of SO_x on the environment ?

SO_x ಗಳ ಮೂಲಗಳು ಯಾವುವು ? ಪರಿಸರದ ಮೇಲೆ SO_x ಗಳಿಂದಾಗುವ ಪರಿಣಾಮಗಳೇನು ?

   b) Explain the conductometric titration of weak acid and strong base with a neat graph.

ದುರ್ಬಲ ಆಮ್ಲಗಳೊಂದಿಗೆ ಪ್ರಬಲ ಪ್ರತ್ಯಾಮ್ಲಗಳ ಕಂಡಕ್ಟೋಮೆಟ್ರಿಕ್ ಟೈಟ್ರೇಶನನ್ನು ಸಚಿತ್ರವಾಗಿ ವಿವರಿಸಿರಿ.

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

IV Semester B.Sc. 4 Degree Examination, September - 2020

PHYSICS (OPTIONAL)

(New Syllabus -Regular (2018-19))

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-A

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

    a)   What is division of wave front?

    b)   What are Newton's rings?

    c)   Define resolving power of a grating and write its expression.

    d)   What is Zone Plate?

    e)   What is double refraction?

    f)   Write any two comparision between positive and negative crystals.

    g)   What is electrical resonance? Write the expression for it.

    h)   Define neutral temperature.

    i)   State Green's theorem in electromagnetic theory.

P.T.O.

j) In a Michelson's interferrometer 500 fringes cross the field of view, when one of the mirror is moved through the distance 0.250 mm, calculate the wavelength of the light.

k) calculate the thickness of a half wave plate of quartz for which μ_o =1.545 and μ_e =1.555 and wavelength of the light used is 589 nm.

l) In a thermocouple if the neutral temperature is 500K. Calculate the temperature of inversion. Given the temperature of Cold junction is 250 K.

PART - B

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

2. Describe Fresnel's Biprism experiment to determine the wavelength of monochromatic light.

3. Compare Zone plate with convex lens.

4. Compare series and parallel resonance circuits.

5. The thermo emf of a thermo couple in micro-volt is given by $E = 16.34\ T - 0.021\ T^2$. When the junctions are at 0°C and 100°C. calculate the neutral temperature, temperature of inversion and thermoelectric power.

6. A plane transmission grating has 15,000 lines per inch. Calculate the angular separation in the Second Order Spectrum between H_α and H_β lines. If wavelength of H_α = 6562A°. and H_β = 4105A°.

7. An a-c source of e.m.f 230 v and 50 Hz is connected to a series circuit containing $R = 100\,\Omega$, $L = 0.5$ mH and $C = 50\ \mu F$. Find the impedance of the circuit and phase angle between voltage and current.

PART - C

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

8. Describe the construction and working of Michelson's interferrometer. How it is used to determine the wavelength of monochromatic light.

9. Explain Fraunhoffer diffraction at a Single slit with neat diagram. Give necessary theory.

10. What are retardation plates? Give the theory of quarter wave plate and half-wave plate.

11. What are thermo electric diagrams? Find peltier co-efficient and Thomson's co-efficient using thermo electric diagrams.

12. State and prove poynting's theorem.

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

PHYSICS (Optional)

(2015-16 onwards)

(Repeater)

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　Maximum Marks : 80

Instruction to Candidates:

1. Use Calculators for Calculations.

2. Write intermediate steps.

3. Give physical meaning for symbols and notations.

PART-A

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

   a) What are Coherent Sources?

   b) What are Newton's rings?

   c) What is Zone plate?

   d) Define resolving power prism.

   e) Define specific rotation of a solution.

   f) What is Argand diagram?

   g) Define neutral temperature.

   h) State stokes theorem in electromagnetic theory.

   i) Define gradient of a Scalar function.

   j) In LCR Series circuit, if the resonant frequency is 3.3KHz and band width is 2KHz, calculate its quality factor

   k) Calculate the radius of first zone in a zone plate of focal length 0.4m and wavelength of light used is 589 nm.

   l) For a given thermo couple calculate the thermoelectric power with junctions at temperatures 0^0C and 110^0C. If $a = 11.2 \mu v /^0 c$ and $b = -\dfrac{1}{42} \mu v /^0 c^2$.

P.T.O.

PART-B

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

2. Derive an expression for the diameter of the bright rings in Newton's rings by reflected light.

3. Derive $\pi = T \cdot \dfrac{dE}{dT}$ where symbols have their usual meanings.

4. Give the physical significance of Curl.

5. In a biprism experiment, at a certain position of the eye-piece the fringe width obtained is 0.25mm, when the eyepiece is moved away by 0.4m the fringe width becomes 0.4mm. If the distance between the two virtual sources is $2 \times 10^{-3} m$. Calculate the wavelength of light used.

6. In a series R-L-C circuit $R = 20\Omega$ and $C = 5\mu F$. Calculate the value of an inductance required to get the maximum current when the circuit is connected to an a.c. source of frequency 100Hz.

7. Calculate thickness of quarter wave plate for a light of wavelength 590 nm, if $n_e = 1.545$ and $n_o = 1.532$.

PART-C

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

8. Describe the construction and working of Michelson's interferrometer. How it is used to determine the wavelength of monochromatic light.

9. Define resolving power of diffraction grating. Derive an expression for it.

10. What are thermoelectric diagrams? Explain how thermoelectric diagrams are used to find

    i) Total e.m.f

    ii) Peltier e.m.f

    iii) Thomson e.m.f

11. Give the theory of Fresnel's theory of rotatary polarization.

12. Mention the Maxwell's equations in differential forms and derive an expression for the velocity of propagation of plane electromagnetic wave in free space.

Reg. No.

IV Semester B.Sc. Degree Examination, September - 2020
BASIC ENGLISH
(Regular)

Time : 3 Hours   Maximum Marks : 80

Text : Eco English.

I. **Answer the following questions in a word, or a phrase or a sentence each: (10×1=10)**

1. What is leading Humanity to the early days of the planet's sixth mass extinction event?

2. Mention the name of the highest mountain in the known universe.

3. Who is the director of UNEP?

4. Which is the most well known area of depleted oxygen?

5. What is the cause for urban growth?

6. What has the huge impact on the environment?

7. Define wildlife biology.

8. What is the percentage of the planet covered by ocean?

9. How the forest management can be ensured?

10. What makes the land productive?

II. **Answer the following in one or two sentences.**   (5×2=10)

1. Why plastic is hazardous to environment and wildlife?

2. What is the prediction of scientists?

3. What are the reasons for natural destruction?

4. What is Hawai and where it is?

5. What is Reforestation?

III. a) List out the reasons and explain the rapid urbanization. (1×10=10)

(OR)

b) Mountains are crucial to life - substantiate.

IV. a) 'Forest certification' - Illustrate the idea. (1×10=10)

(OR)

b) Point out the solutions for saving marine life.

V. Write short notes. (Any two). (2×5=10)

1. Dead Zones

2. Reforestation

3. Global Green House Gas

4. Wildlife conservation.

VI. Correct the following sentences. (10×1=10)

1. He went to work despite of his illness.

2. Raju, who he is my best friend, is a writer.

3. I have decided to quit my job a week ago.

4. I prefer coffee than tea.

5. It is raining very frequently even in winters.

6. A good teacher not only teach, but also is also a guide.

7. Father divided his property among his two sons.

8. All kind of stationaries are sold here.

9. He is an university professor.

10. Ganga is a holy river.

VII. A) Do as directed.   (5×1=5)

1. Doctor said to him, "Avoid unhealthy food". (Indirect).

2. She said that she was buying a laptop that day. (Direct).

3. He says, "I am playing cricket". (Indirect).

4. John said that he had bought a book for me. (Direct).

5. Raju said to me, "Do you like tea?" (Indirect).

B) Change the voices.   (5×1=5)

1. John painted the house last week.

2. My laptop was stolen.

3. Mom read the novel in one day.

4. Did she do her duty?

5. Has the report been finished by you?

VIII.A) Write a letter of application for the post of Assistant professor in the college. (5)

B) Write a paragraph on the topic importance of sports.   (5)

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Reg. No. ☐☐☐☐☐☐☐☐

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

MATHEMATICS (Optional)

Paper - I : Vector calculus and Infinite Series

(w.e.from 2015-16)

(Repeater/Regular)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

   1.   Question paper contains 3 parts namely A,B,C.

   2.   Answer all parts.

Part - A

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

   a)   If $\vec{u} = t^2 i - tj + (2t+1)k$ and $\vec{v} = (2t-3)i + j - tk$ then find $\dfrac{d}{dt}(u.v)$.

   b)   If $\vec{a}$ is a constant magnitude and is a vector function of some scalar variable t then

   prove that $\vec{a}.\dfrac{d\vec{a}}{dt} = 0$.

   c)   If $\phi(xyz) = 3x^2 y - y^3 z^2$ then find $\nabla\phi$ at the point (1,-2,-1).

   d)   If $\vec{f} = xyzi + 3x^2 yj + (xz^2 - y^2 z)k$ then find divf at (1,-1,1).

   e)   Show that the vector $\vec{F} = (x+3y)i + (y-3z)j + (x-2z)k$ is solenoidal.

   f)   Define convergent series and give an example.

   g)   Test the series $\sqrt{\dfrac{1}{2}} + \sqrt{\dfrac{2}{3}} + \sqrt{\dfrac{3}{4}} + \ldots$.

   h)   If $\sum u_n$ and $\sum v_n$ be a series of positive terms such that $u_n \geq kv_n \forall n$ and $\sum v_n$ is

   divergent then $\sum u_n$ is divergent.

   i)   State D'Alambert's Ratio test.

P.T.O.

j) Show that the series $\sum_{n=1}^{\infty}\dfrac{1}{n(n+1)}$ is convergent.

k) Discuss the convergence of the series $1-\dfrac{1}{3}+\dfrac{1}{5}-\dfrac{1}{7}+\ldots\ldots$

l) Define absolute convergent and give an example.

Part - B

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

2) If $\vec{A}$ and $\vec{B}$ are differentiable vector function of a scalar variable t, then prove that

$$\frac{d}{dt}(\vec{A}.\vec{B})=\frac{d\vec{A}}{dt}.B+A.\frac{d\vec{B}}{dt}$$

3) Prove that $div(curl\,\vec{A})=0$.

4) If $\sum u_n$ and $\sum v_n$ are two positive terms series and $\lim\limits_{n\to\infty}\dfrac{u_n}{v_n}$ be finite and non zero quantity then prove that $\sum u_n$ and $\sum v_n$ both convergent or diverge together.

5) State and prove cauchy's integral test.

6) Test the convergence of the series $\dfrac{1}{1.2}+\dfrac{2}{3.4}+\dfrac{3}{5.6}+\ldots\ldots$.

7) Discuss the convergence of the series $\sum(-1)^{n-1}\dfrac{n}{(2n-1)}$.

Part - C

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

8) a) State and prove the necessary and sufficient condition for a vector function f(t) to have a constant magnitude is $\vec{f}.\dfrac{d\vec{f}}{dt}=0$.

b) If $\vec{a}=(xyz)i+(xz^2)j+y^3k$ and $\vec{b}=x^3i+xyzj+x^2zk$ then evaluate $\dfrac{\partial^2 a}{\partial y^2}\times\dfrac{\partial^2 b}{\partial x^2}$.

9) a) Prove that, Curl Curl F = 0 where $\vec{F} = zi + xj + yk$.

b) Prove that, Curl $(\vec{A} + \vec{B}) = Curl\vec{A} + Curl\vec{B}$.

10) a) Prove that, the series $\sum_{n=1}^{\infty} x^{n-1}$ i.cgt. for $|n| < 1$ and divergent for $|n| > 1$.

b) Test the convergence of the series $\sum_{n=1}^{\infty} (\sqrt{n^2 + 1} - n)$.

11) a) State and prove Cauchy's root test for convergence.

b) Test the convergence of the series $\dfrac{1}{2} + \dfrac{1.3}{2.4} + \dfrac{1.3.5}{2.4.6} + \ldots$

12) a) State and prove Leibnitz's theorem for convergence of alternating series.

b) Examine the convergence of $\Sigma(-1)^n \dfrac{x^n}{n(n-1)}$ 0<x<1.

Reg. No. ☐☐☐☐☐☐☐☐

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

MATHEMATICS (Optional)

Paper - II: Group Theory, Fourier Series and Differential Equations

(Regular and Repeaters w.e.f. 2015-2016 onwards)

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

Instructions to Candidates :

    1.   Question Paper contains Three Parts namely A, B and C.

    2.   Answer All Parts.

PART-A

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

1.   a)   Prove that every Subgroup of an Abelian Group is normal.

    b)   Prove that a Quotient Group of an Abelian Group is also Abelian.

    c)   If $f : G \to G'$ be a homomorphism from a Group G into G', then prove that $f(e) = e'$.

    d)   State Dirichlet's Conditions for Fourier Expansion.

    e)   Find the Fourier Constant a_0, for $f(x) = x - 1$ in $(-\pi, \pi)$.

    f)   Define half-range Sine and Cosine Series.

    g)   Find the Finite Fourier Cosine Transform of the function $f(x) = 2 - x$ in $(0, 2)$.

    h)   Find the Complementary Function of $3\dfrac{d^2y}{dx^2} + 4\dfrac{dy}{dx} - 4y = e^{2x}$.

    i)   Find the particular integral of $\dfrac{d^2y}{dx^2} - 4y = \text{Cos}^2x$.

    j)   Solve $\dfrac{d^2y}{dx^2} + 4y = x^2$.

P.T.O.

k) Solve $x^2 \dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} - 4y = 0$.

l) Show that the Differential Equation $Sinx \dfrac{d^2y}{dx^2} - Cosx\dfrac{dy}{dx} + 2ySinx = 0$ to be exact.

PART - B

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

2. State and prove the Fundamental Theorem of Homomorphism of Groups.

3. Obtain the Fourier Series of $f(x) = x^2$ in $[-\pi, \pi]$.

4. Find half-range Sine and Cosine Series for the function $f(x) = 2x - 1$ in $[0, \pi]$.

5. Solve $\dfrac{d^3y}{dx^3} + 6\dfrac{d^2y}{dx^2} + 11\dfrac{dy}{dx} + 6y = e^{2x}$.

6. Solve $\dfrac{d^2y}{dx^2} + 2y = xSinx$.

7. Solve $x^2\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + 2y = x\log x$.

PART - C

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

8. a) Define Kernel of a Homomorphism and prove that Kernel of Homomorphism is a normal Subgroup.

   b) Prove that every Quotient Group of a Cyclic Group is Cyclic.

9. a) Obtain the Fourier Series of $f(x) = e^{-ax}$ in $[-\pi, \pi]$.

   b) Find the half-range Sine and Cosine Series for $f(x) = x^2$ in $[0, \pi]$.

10. a) Find the Finite Fourier Sine and Cosine Transformations of $f(x) = \pi - x$ in $(0, \pi)$.

   b) Find the Finite Cosine Transform of $f(x) = 1 + x$ in $(0, 3)$.

11. a) With usual notations, prove that $\dfrac{1}{f(D)} e^{ax} v = e^{ax} \dfrac{1}{f(D + a)} v$ where v is a function of x.

   b) Solve $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + 3y = x^2 + \operatorname{Sin}x$.

12. a) Derive the Condition for the Differential Equation

$$P_0 \frac{d^3y}{dx^3} + P_1 \frac{d^2y}{dx^2} + P_2 \frac{dy}{dx} + P_3 y = 0 \text{ to be exact.}$$

   b) Verify the Condition for Exactness and solve the Differential Equation

$$(1 + x^2)\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = 0.$$