[1 - 21]

35537/E370/42537

Reg. No. 1

V Semester B.sc 3/B.sc 4 Degree Examination, Nov/Dec. - 2019

MATHEMATICS (Optional)

Real Analysis

(Regular/Repeaters - W.E.F 2016-17)

Paper : I

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

Instructions to Candidates:

1. **Question paper has three parts namely A, B, C.**
2. **Answer all questions.**

PART - A

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

a) Define norm of a partition. If $P=\{1,1.3,1.5,1.6,1.9,2\}$ be a partition of $[1,2]$ then find norm of P.

b) Prove that every constant function is R-integrable.

c) If $f \in R[a,b]$ then prove that $|f| \in R[a,b]$.

d) State Fundamental Theorem of integral calculus.

e) Prove that $\left|\int_a^b Sinx^2\,dx\right| \leq \frac{1}{a}$

f) Test the convergence of $\int_0^1 \frac{dx}{\sqrt{x(1+x)^2}}$

g) Separate the following integrals into proper and improper with justification.

i) $\int_0^1 \frac{Sinx}{x}dx$ ii) $\int_1^2 \frac{dx}{\sqrt{2-x}}$

h) State Dirichlet's Test for convergence of improper integral.

i) Define Beta function. Write the following integral in terms of Beta function $\int_0^1 \frac{\sqrt{x}}{\sqrt{1-x}}dx$

P.T.O.

j) Prove that $\int_0^1 \left(\log\frac{1}{y}\right)^{n-1} dy = \lceil n$

k) Evaluate $\int_0^1\int_0^1 \frac{dx\,dy}{\sqrt{1-x^2}\sqrt{1-y^2}}$

l) Evaluate $\int_0^1\int_0^2\int_0^{\sqrt{xy}} xyz\,dz\,dy\,dx$

PART - B

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

2. If $f \in R[a,b]$ then prove that $m(b-a) \le \amalg(p,f) \le \int_a^b f(x)\,dx \le \amalg(p,f) \le M(b-a)$.

3. If f and g are R-integrable then prove that fg is also R-integrable.

4. Test the convergence of integral $\int_a^b \frac{dx}{(x-a)^n}$

5. Prove that $\int_0^1 x^{m-1}(1-x)^{n-1}\,dx = 2\int_0^{\pi/2} Sin^{2m-1}x\,Cos^{2n-1}x\,dx$

6. Prove that $\int_0^\infty x^n e^{-a^2x^2}\,dx = \frac{1}{2a^{n+1}}\left\lceil\frac{n+1}{2}\right.$ and hence evaluate $\int_0^\infty e^{-4x^2}\,dx$

7. Find the volume of sphere by using triple integral.

PART - C

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

8. a) State and prove necessary and sufficient condition for f(x) to be R-integrable on [a, b].

b) Prove that the function $f(x) = x^2 + x$ is R-integrable on [2, 3] and hence find $\int_2^3 f(x)\,dx$.

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9. a) State and prove Wiestrass form of second mean value Theorem of integral of product.

b) Prove by first mean value theorem that $\frac{\pi^3}{5} \le \int_0^{\pi} \frac{3x^2}{3+2Sinx} dx \le \frac{\pi^3}{3}$.

10. a) If f (x) and g (x) are positive functions on [a,b] and $x \xrightarrow{lt} a \frac{f(x)}{g(x)} = l$, where 'a' being point of infinite discontinuity and $l \neq 0, l \neq \infty$ then integrals $\int_a^b f(x)\,dx$ and $\int_a^b g(x)\,dx$ converge or diverge together.

b) Prove that $\int_0^{\infty} e^{-ax^2} \cos bx\, dx, a > 0$ is convergent using Abel's Test.

11. a) Prove that $\lceil m \left| m+\frac{1}{2} \right. = \frac{\sqrt{\pi}}{2^{2m-1}} \lceil 2m$ and hence find $\left| \frac{1}{4} \right. \left| \frac{3}{4} \right.$

b) Prove that $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta \int_0^{\pi/2} \frac{1}{\sqrt{\tan\theta}} d\theta = \frac{\pi^2}{2}$.

12. a) If $f(x,y)$ and $\frac{\partial f}{\partial x}$ are continuous functions of x and y for $a \le x \le b, c \le y \le d$, then prove that

$$\frac{d}{dy}\int_a^b f(x,y)\,dx = \int_a^b \frac{\partial}{\partial y}\left(f(x,y)\right)dx.$$

b) Prove that $\int_{\frac{-\pi}{2}}^{\pi/2} \frac{\log(1+b\sin x)}{\sin x} dx = \pi Sin^{-1} b$ where $|b| < 1$.

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35538/E380/42538

Reg. No. | | | | | | | | |

V Semester B.Sc 3/4 Degree Examination, Nov./Dec. - 2019

MATHEMATICS (Optional)

(Regular)

Paper : II - Numerical Analysis

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

Instructions to Candidates:

1. **Answer all questions.**
2. **Students are allowed to use scientific calculators.**

PART - A

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

a) Find the real root of $x^3 - 7x + 5 = 0$ in [2, 3] by bisection method in two stages.

b) Explain briefly Iteration method to find the real root of $f(x) = 0$.

c) With usual notation, Prove that $\Delta = E - S$.

d) If $u_0 = 3, u_1 = 12, u_2 = 81, u_3 = 200, u_4 = 100, u_5 = 8$ find $\Delta^5 u_0$.

e) Evaluate $\Delta^{10}(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)$ where h=1.

f) Write the formula to find the first derivative using forward difference.

g) State Trapezoidal rule to evaluate $\int_a^b f(x)\,dx$.

h) From the Taylor's series for $y(x)$, find 'y' at x = 0.2. If $y(x)$ satisfies $\frac{dy}{dx} = 2y + 3e^x, y(0) = 0$.

i) Explain Euler's method to solve $\frac{dy}{dx} = f(xy)$ with intial condition $y(x_0) = y_0$.

j) Find the order and degree of the differential equation $y_{n+3} - 8y_{n+1} - 15y_n = 5x - 2$.

k) From the differential equation eliminating a and b from the relation $y_n = a.2^n + b(-2)^n$.

l) Write the formula for second order Runge-kutta method.

P.T.O.

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PART - B

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

2. Explain the Gauss-Seidal method to solve the equations $a_1x+b_1y+c_1z=d_1$, $a_2x+b_2y+c_2z=d_2$, $a_3x+b_3y+c_3z=d_3$.

3. Express $f(x)=11x^4+5x^3+2x^2+x-15$ and its successive differences in a factorial notations, h=1.

4. Evaluate $\int_0^4 e^x dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ Rule.

5. State and prove Newton-Gregory Forward interpolation formula.

6. Determine the value of y when x = 0.1 given that $y(0)=1$ and $\frac{dy}{dx}=\frac{y-x}{y+x}$ using Euler modified method.

7. Solve $y_{x+2}-3y_{x+1}-4y_x=3^x$.

PART - C

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

8. a) Derive the Newton-Raphson formula $x_{i+1}=x_i-\frac{f(x_i)}{f^1(x_i)}$.

   b) Find the cube root of 15 correct to four decimal figures by Iteration method.

9. a) State and prove Lagrange's interpolation formula for un equal intervals.

   b) From the following table, half yearly premium for policies maturing at different ages the premium for policy maturing at the age 63.

Age :	45	50	55	60	65
Premium :	114.84	96.16	83.32	74.48	68.48

10. a) Derive the 'General Quadrature Formula' for equidistant ordinates and hence deduce Simpson's $\left(\frac{3}{8}\right)^{th}$ rule from it.

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b) Find $f'(0.4)$ and $f''(0.4)$ from the following table.

x :	0.1	0.2	0.3	0.4
f(x) :	1.10517	1.22140	1.34986	1.49182

11. a) Explain Picards method to solve the equation $\frac{dy}{dx} = f(xy)$ with initial condition $y(x_0) = y_0$.

b) Using Runge-Kutta method of order 2, Find $y(0.2)$, given that $\frac{dy}{dx} = \frac{y^2 + x^2}{10}, y(0) = 1$ take h=0.1.

12. a) Solve $y_{x+2} + 4y_x = (Sinx)2^x$

b) Solve $y_{x+2} - 7y_{x+1} + 10y_x = 12.4^x$

35543/E43

Reg. No. 8

V Semester B.Sc. 3 Degree Examination, Nov./Dec - 2019

PHYSICS (Optional)

(Repeater)

Paper - II

Time : 3 Hours **Maximum Marks : 8**

Instructions to Candidates:

1) Calculators are allowed for calculations
2) Write intermediate steps.

PART - I

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

a) What is population inversion in LASER.

b) What are matter waves.

c) State Heisenberg's uncertainty principle.

d) What is zero point energy.

e) Who proposed the first atomic model.

f) What is stark effect.

g) Distinguish between line spectrum and band spectrum.

h) What is Larmor's precession.

i) Distinguish between normal Zeeman effect and anamolous Zeeman effect.

j) In Raman spectrum wavelength of incident light is 590 nm and wavelength of Stoke's line is 600 nm. Calculate the Raman Shift in Hertz.

k) Prove that $J_0^1 = -J_1$.

l) Calculate the de - Broglie wavelength for a beam of electrons whose energy is 100 eV.

Given : $h = 6.6\times10^{-34}$ J.S. $m_e = 9.1\times10^{-31}$ kg.

P.T.O.

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PART - II

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

2. Illustrate uncertainty principle by diffraction of electrons at a single slit.

3. Deduce time - independent Schrodinger wave equation.

4. Explain LS and jj coupling.

5. Prove that $\int_{-1}^{+1} xP_n(x)P_{n-1}(x)dx = \frac{2n}{4n^2-1}$.

6. Calculate the Zeeman shift observed in the normal Zeeman effect when a spectral line of wavelength $5400\,\overset{0}{A}$ is subject to the magnetic field of 1T.

7. Calculate the wavelength of x - ray scattered at 60° from an electron, if the frequency of the incident rays is 5×10^8 Hz.

PART - III

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

8. Explain Davison and Germer experiment to prove de - Broglie hypothesis.

9. Derive an expression for energy of a particle in one - dimensional box.

10. Derive an expression for magnetic moment due to orbital motion and spin motion of electron.

11. Explain types of molecular motion and types of molecular spectra. Give applications of molecular spectroscopy.

12. Derive Rodrigue's formula for Legendre polynomials.

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35539/E390/42539

Reg. No. | | | | | | | | |

V Semester B.Sc.3/B.Sc.4 Degree Examination, Nov./Dec. - 2019

MATHEMATICS (Optional)

(Dynamics and calculus of variations)

(Regular and Repeaters w.e.f. 2016-2017 New Syllabus)

Paper - III

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

Instructions to Candidates:

1. **Question paper has 3 parts namely A,B and C**
2. **Answer all questions.**

PART - A

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

a) If the angular velocity of a point moving in a plane curve be constant about a fixed point. Show that its acceleration varies as its radial velocity.

b) Show that tangential acceleration of a particle moving in a plane curve is $v\frac{dv}{ds}$.

c) A particle is projected with velocity u, making an angle α with horizon. Find the time of flight.

d) Write an expressions for latus rectum and vertex of the parabola traced by the projectile.

e) Prove that if a smooth sphere impinges obliquely on another smooth sphere at rest, then later begins to move along the line of centres.

f) Find the law of force, if central orbit is $\frac{b^2}{p^2}=\frac{2a}{r}-1$.

g) Define the terms

i. central force

ii. Central orbit.

h) Find the extremal of the functional $\int_{x_0}^{x_1}(x+y')y'dx$.

P.T.O.

i) Find the solution of Euler's equation when f is independent of x.

j) State Brachistochrone problem.

k) Define Geodesic and what is Geodesic on a sphere?

l) Define isoperimetric problem.

PART - B

(4×5=20)

II. Answer any **Four** of the following.

2. A point moves in a plane curve such that its tangential acceleration is constant and magnitude of the tangential velocity and normal acceleration are in constant ratio. Show that the intrinsic equation of the path is of the form $S = A\psi^2 + B\psi + C$.

3. The law of force is μu^3, a particle is projected from an apse at a distance 'a' with velocity $\frac{2}{a}\sqrt{\frac{\mu}{3}}$. Show that equation of the orbit is $r\cos\frac{\theta}{2} = a$.

4. Derive the equations of motion in case of direct impact of two smooth spheres and also find impulse due to impact.

5. A smooth sphere of mass m impinges on another smooth sphere of mass 2 m at rest, the direction of motion making an angle 45° with line of centres at the moments of impact. If e = 1/2. Show that their path after impact are at rt. angle.

6. Show that general solution of Euler's equation for the integral $I = \int_1^2 \frac{\sqrt{1+y'^2}}{x}dx$ with end condition y(1) = 0, y(2) = 1 is $x^2 + (y-2)^2 = 5$.

7. Find the extremal of the functional $I = \int_0^1 \left(y'^2 + x^2\right)dx$ with end conditions y(0) = 0 = y(1) subjected to the constraint $\int_0^1 y\,dx = \frac{1}{6}$.

AA

PART - C

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

8. a) Derive an expressions for radial and transverse velocities and accelerations of a particle moving along a plane curve.

b) A particle describes an equiangular spiral $r = ac^{\theta}$ in such a manner that its acceleration has no radial component prove that its angular velocity is constant and magnitude of the velocity and acceleration is each proportional to r.

9. a) With usual notations prove that $F = h^2u^2\left(\frac{d^2u}{d\theta^2} + u\right)$.

b) A particle moves in an ellipse under a force which is always towards its focus. Show that law of force is $\frac{\mu}{r^2}$.

10. a) Find the equation of path of a projectile.

b) A ball is projected so as just to clear two walls, the first height 'a' at a distance 'b' from the point of a projection and the second of height 'b' at a distance 'a' from the point of projection. Show that the range on horizontal plane is $\frac{a^2 + ab + b^2}{a + b}$.

11. a) State and prove necessary condition of Euler's equation.

b) Find the curve passing through $(0,0)$ and $(\pi,0)$ along which the functional $\int_0^{\pi}\left(y'^2 + 2y\sin x\right)dx$ an extremum.

12. a) Show that geodesic in an Euclidean plane is a straight line.

b) Prove that the sphere is the solid figure of revolution which, for a given surface area S, has maximum volume.

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35542/E420

Reg. No. | | | | | | | | |

12

V Semester B.Sc. 3 Degree Examination, Nov./Dec.- 2019

PHYSICS

(Optional) (Fresh New Syllabus 2014 - 15 Onwards)

Paper - I

(Immediate Repeaters)

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

Instructions to Candidates:

Simple calculators are allowed for calculations write intermediate steps.

PART - I

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

a) What is degrees of freedom?

b) What is bounded motion?

c) What is quantum computing?

d) Mention relativistic mass formula.

e) What is T.U.F.

f) Mention two applications of Nanoparticles.

g) What is Barkwdsen criteria?

h) Define Drain resistance.

i) What is frequency response? Show graphically.

j) A zener diode has breakdown voltage of 9.1 volts and maximum power dissipation is 364 m watts. What is the maximum current drawn?

k) Find the velocity at which the mass of the particle is double its rest mass.

l) If the applied input power to HWR is 100 watts, find the dc power output when the rectification efficiency is 37%.

P.T.O.

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PART - II

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

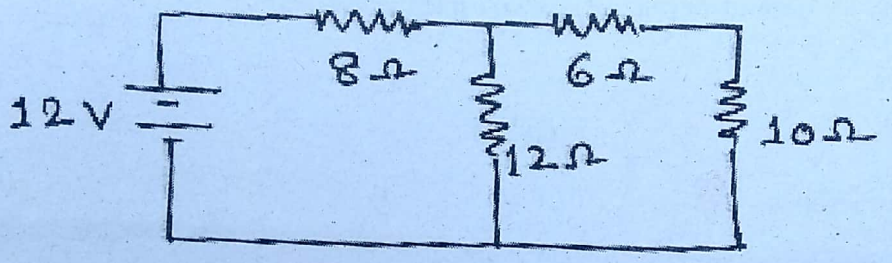
2. Explain holonomic and non - holonomic constraints with examples.

3. State and explain Kepler's law of motion Deduce the second law.

4. Explain the working of single electron transistor.

5. Calculate the speed of the particle of rest mass 3.33×10^{-30} kg whose kinetic energy is 2 meV.

6. Using Norton's theorem, Find the current in 10Ω resistor in the network shown below.



7. A Heartley oscillator has a capacitor of 250 pf and the inductance at each part of the inductance coil is 1.5 mH. Calculate the operating frequency neglecting mutual inductance between coils.

PART - III

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

8. Derive Langrange's equations of motion from D'Alemberts principle.

9. Derive Lorentz transformation equations.

10. State and Prove Thevnin's theorem.

11. Explain with neat circuit diagram of L section and π section filters and obtain expression for ripple factors.

12. With neat circuit diagram explain the working of phase shift oscillator write expression for its frequency of oscillations.

42543/E430

Reg. No. | | | | | | | | | |

14

V Semester B.Sc. 4 Degree Examination, Nov./Dec. - 2019
PHYSICS (Optional)
(Regular)
(Fresh- New Syllabus 2019-20 Onwards)
Paper : II

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

Instructions to Candidates:

Simple calculators are allowed for calculations. Write intermediate steps.

PART-I

(10×2=20)

1. Answer any **TEN** questions :

a) What is compton shift?

b) What is the average life time of an atom in a metastable state?

c) State the orthogonal condition for wave function.

d) What is degeneracy?

e) What is space quantisation?

f) State Pauli's Exclusion principle.

g) State Larmor's precession theorem.

h) Mention the types of molecular spectra.

i) Show that $2.J_n'(x) = J_{n-1}(x) - J_{n+1}(x)$.

j) Write Hermite differential equation.

k) If the uncertainity in the position of an electron is $4 \times 10^{-10}\ m$, calculate the uncertainty in the momentum.

l) Calculate Lande's g factor for $2S_{1/2}$ state.

PART - II

(4×5=20)

Answer any FOUR questions :

2. Illustrate uncertainty principle by Gamma ray microscope.

3. Give the Physical significances of wave function.

4. Outline the theory of anomalous zeeman effect.

P.T.O.

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5. Show that $\int_{-1}^{+1} P_m(x).P_n(x)\,dx = 0, \forall m \neq n$

6. In an experiment on the study of Raman effect using mercury green radiation of wavelength 540 nm a Raman line of wave length 544 nm. Calculate the frequency & Wavelength of the corresponding antistoke lines?

7. Obtain total Energy of electrons if there are 10 electrons in a box of size 10^{-10} m in 1 dimension.

PART - III

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

8. Derive an expression for de-Broglie wavelength. Explain Davison-Germer experiment to prove de-Broglie hypothesis.

9. Derive an expression for energy of a particle in one dimensional box. Show the energy levels and wave functions.

10. What is spin & space quantization? Derive an expression for magnetic moment of an electron due to orbital motion.

11. Derive an expression for the energy of a diatomic molecule as a rigid rotator.

12. Derive the orthogonality of Bessel's function.

42526/E260/35526

Reg. No. | | | | | | | | | |

16

V Semester B.Sc.4/3 Degree Examination, Nov./Dec. - 2019

CHEMISTRY

(Regular and Repeater 2014-15 Onwards)

Paper - II (Optional)

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

Instructions to Candidates:

1. **All questions are compulsory.**
   ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳು ಕಡ್ಡಾಯ.
2. **Answer all questions in the same answer book.**
   ಎಲ್ಲಾ ಉತ್ತರಗಳನ್ನು ಒಂದೆ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆಯಿರಿ.
3. **Draw neat diagram and give equations.**
   ಅಂದವಾದ ಆಕೃತಿಯನ್ನು ಮತ್ತು ರಸಾಯನಿಕ ಸೂತ್ರವನ್ನು ಬರೆಯಿರಿ.

SECTION - A

ವಿಭಾಗ – ಎ

(10x2=20)

1. Answer any TEN of the following.

a) What are alloys ? Write composition of steel.
   ಮಿಶ್ರಲೋಹಗಳೆಂದರೇನು ? ಸ್ಟೀಲ್‌ನ ಮೂಲಭೂತ ವಿಧಿಯನ್ನು ಬರೆಯಿರಿ.

b) What is glass ? Mention its types.
   ಗಾಜು ಎಂದರೇನು ? ಮತ್ತು ಅದರ ವಿಧಗಳನ್ನು ಬರೆಯಿರಿ.

c) What is titanium white ? Mention one use.
   ಟೈಟಾನಿಯಂ ಬಿಳಿ ಎಂದರೇನು ? ಮತ್ತು ಅದರ ಒಂದು ಉಪಯೋಗ ತಿಳಿಸಿ.

d) Give two advantages of gaseous fuels ?
   ಅನಿಲ ಇಂಧನಗಳ ಎರಡು ಲಾಭಗಳನ್ನು ವಿವರಿಸಿ.

e) Write Freundlich emprical relationship for adsorption.
   ಫ್ರೇಂಡ್ಲಿಚ್ ಇಂಪ್ರಿಕಲ್ ಮತ್ತು ಹೊರಹೀರುವಿಕೆಯ ಸಂಬಂಧವನ್ನು ವಿವರಿಸಿ.

f) Expand LAH and give two uses.
   LAH ನ್ನು ವಿಸ್ತರಿಸಿ ಮತ್ತು ಎರಡು ಉಪಯೋಗಗಳನ್ನು ವಿವರಿಸಿ.

P.T.O.

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g) What is base peak ? Give one example.
ಒಂದು ಉದಾಹರಣೆಯೊಂದಿಗೆ ಬೇಸ್‌ಪಿಕ್‌ನ್ನು ವಿವರಿಸಿ.

h) What are azo dyes ? Give one example.
ಅಸ್ಸೊ ವರ್ಣಗಳೆಂದರೇನು ? ಅದರ ಒಂದು ಉದಾಹರಣೆ ಬರೆಯಿರಿ.

i) Write BEQ equation and mention the terms involved in it.
BEQ ಸಮ್ಮಿಕರಣವನ್ನು ಬರೆದು ಅದರಲ್ಲಿಯ ಪದಗಳನ್ನು ವಿವರಿಸಿ.

j) What is calorific value of a fuel ?
ಇಂಧನದ ಕ್ಯಾಲೋರಿಫಿಕ್ ಮೌಲ್ಯ ಎಂದರೇನು ?

k) Explain homogeneous catalysis with one example.
ಸಮಜಾತಿಯ ವೇಗವರ್ಧನೆಯನ್ನು ಒಂದು ಉದಾಹರಣೆಯೊಂದಿಗೆ ವಿವರಿಸಿ.

l) Give one example when K_p becomes equal to K_c.
ಒಂದು ಉದಾಹರಣೆಯನ್ನು ಬರೆಯಿರಿ ಯಾವಾಗ K_p ಮತ್ತು K_c ಸಮನಾಗಿರುತ್ತವೆ.

SECTION - B

ವಿಭಾಗ - ಬಿ

Answer any four of the following. **(4x5=20)**

2. Discuss two applications of (i) ferrous alloys and (ii) non-ferrous alloys.
ಕಬ್ಬಿಣ ಮಿಶ್ರಲೋಹ ಮತ್ತು ಕಬ್ಬಿಣವಲ್ಲದ ಮಿಶ್ರಲೋಹಗಳ ಎರಡು ಉಪಯೋಗಗಳನ್ನು ವಿವರಿಸಿ.

3. Explain the manufacture of port land cement by dry process.
ಪೊರಟ್ ಲ್ಯಾಂಡ್ ಸಿಮೆಂಟ್‌ನ್ನು ಬಣ ವಿಧಾನದಿಂದ ತಯಾರಿಸುವಿಕೆಯನ್ನು ವಿವರಿಸಿ.

4. Explain the preparation of Biogas. Write composition and two applications of bio gas.
ಬಾಯೊಗ್ಯಾಸ ತಯಾರಿಸುವ ವಿಧಾನವನ್ನು ವಿವರಿಸಿ ಮತ್ತು ಅದರ ಮಿಶ್ರಣದ ಅನುಪಾತವನ್ನು ಹೇಳಿ ಎರಡು ಉಪಯೋಗಗಳನ್ನು ಬರೆಯಿರಿ.

5. Write the mechanism of formation of Amide by using DCC.
DCC ಉಪಯೋಗಿಸಿ ಅಮೈಡ್‌ನ್ನು ತಯಾರಿಸುವ ಯಾಂತ್ರಿಕ ರಚನೆಯನ್ನು ವಿವರಿಸಿ.

6. What are dyes ? Give the synthesis of Malachite green.
ವರ್ಣಗಳೆಂದರೇನು ? ಮೆಲಾಕ್ಯಾಟ್ ಹಸಿರನ್ನು ಸಂಶ್ಲೇಷಿಸಿಸುವ ವಿಧಾನವನ್ನು ಬರೆಯಿರಿ.

7. Give the relation between K_p, K_c and K_x.
K_p, K_c ಮತ್ತು K_x ನಡುವಿನ ಸಂಬಂಧಗಳನ್ನು ವಿವರಿಸಿ.

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SECTION - C

ವಿಭಾಗ - ಸಿ

Answer any four of the following. **(4x10=40**

8. a) How is brass manufactured by electro-deposition method ? Give two uses of brass.

ಇಲೇಕಟ್ರೊ ಡಿಪೊಸಿಶನ್ ವಿಧಾನದಿಂದ ಹಿತ್ತಾಳೆ ತಯಾರಿಸುವಿಕೆಯನ್ನು ವಿವರಿಸಿ. ಹಿತ್ತಾಳೆಯ ಎರಡು ಉಪಯೋಗಗಳನ್ನು ಬರೆಯಿರಿ.

b) Explain the manufacture of glass. Give the composition of Borosilicate glass.

ಗ್ಲಾಸ್ ತಯಾರಿಸುವ ವಿಧಾನವನ್ನು ವಿವರಿಸಿ. ಬೋರೊಸಿಲಿಕೇಟ್ ಗ್ಲಾಸ್‌ನ ಅನುಪಾತವನ್ನು ಬರೆಯಿರಿ.

9. a) Explain the theory of colour and constitution of dyes.

ಬಣ್ಣಗಳ ಸಿದ್ಧಾಂತ ಮತ್ತು ವರ್ಣಗಳ ಸಂವಿಧಾನದ ಬಗ್ಗೆ ವಿವರಿಸಿ.

b) Derive Michaelis-Menten equation.

ಮೇಚಿಲ್‌ಸ್ ಮೇನಟ್‌ರ್ ಸಮ್ಮಿಕರಣವನ್ನು ಬಿಡಿಸಿ.

10. a) Describe the instrumentation of mass spectroscopy.

ಮಾಸ್‌ರೋಹಿತ ಮಾಪಕದ ಉಪಕರಣವನ್ನು ವಿವರಿಸಿ.

b) Write a note on varnishes and paints.

ವಾರನಿಷ ಮತ್ತು ಪೇಂಟ್‌ನ ಬಗ್ಗೆ ಒಂದು ಟಿಪ್ಪಣಿಯನ್ನು ಬರೆಯಿರಿ.

11. a) Write the synthesis of DDQ and how it is used in the Benxylic oxidation of tetralin.

DDQ ಸಂಶ್ಲೇಪಿಸಿ ಬರೆಯಿರಿ ಮತ್ತು ಟೆಟ್ರಾಲಿನ್‌ನ ಬೆಂಜೈಲಿಕ ಉತ್ಕರ್ಷಣದಲ್ಲಿ ಇದರ ಬಳಕೆಯನ್ನು ವಿವರಿಸಿ.

b) Deduce Vant Hoff's reaction isotherm.

ವ್ಯಾಂಟ್ ಹಾಫ ಪ್ರತಿಕ್ರಿಯ ಸಮತಾಪಿಯನ್ನು ಹೇಗೆ ಕಡಿತಗೊಳಿಸುವಿರಿ ?

12. a) Explain the steps involved in the mechanism of chain reaction with suitable example.

ಉದಾಹರಣೆಯೊಂದಿಗೆ ಸರಣಿಕ್ರಿಯೆಯ ಯಾಂತ್ರಿಕ ರಚನೆಯಲ್ಲಿ ಬರುವ ಕ್ರಮಗಳನ್ನು ವಿವರಿಸಿ.

b) Derive langumuir adsorption isotherm.

ಲಾಂಗಮ್ಯರ್ ಹೊರಹೀರುವಿಕೆಯ ಸಮತಾಪಿಯನ್ನು ವಿವರಿಸಿ ಬಿಡಿಸಿರಿ.

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V Semester B.Sc. 4/3 Degree Examination, Nov./Dec. - 2019

CHEMISTRY (Optional)

(Repeater and Regular)

Paper - I

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

Instructions to Candidates:

1. **All** questions are compulsory.
   ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೂ ಕಡ್ಡಾಯವಾಗಿ ಉತ್ತರಿಸಿರಿ.
2. Answer **All** the questions in the **same** answer book.
   ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೂ **ಒಂದೇ** ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಉತ್ತರಿಸಿ.
3. Draw neat **diagrams** and give equations wherever necessary.
   ಅವಶ್ಯಕತೆ ಇರುವಲ್ಲಿ ನೀಟಾದ ಆಕೃತಿ ರಚಿಸಿ ಸಮೀಕರಣಗಳನ್ನು ಬರೆಯಿರಿ.

SECTION - A

ವಿಭಾಗ – ಎ

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

ಬೇಕಾದ **ಹತ್ತು (10)** ಪ್ರಶ್ನೆಗಳಿಗೆ ಮಾತ್ರ ಉತ್ತರಿಸಿರಿ.

a. Write the IUPAC names of the following.

ಕೆಳಗಿನವುಗಳಿಗೆ IUPAC ಹೆಸರುಗಳನ್ನು ಕೊಡಿರಿ.

i) $[Fe(CN)_6]^{3-}$

ii) $[Fe(CN)_6]^{4-}$

b. Mention the favourable conditions for precipitation.

ಪ್ರೆಸಿಪಿಟೇಷನ್‌ಗೆ ಅನುಕೂಲಕರವಾದ ಸ್ಥಿತಿಗಳನ್ನು ಬರೆಯಿರಿ.

c. What is hydrate isomerism ? Give example.

ಹೈಡ್ರೇಟ್ ಸಮಾನ ಕಾಂತೀಯತೆ ಎಂದರೇನು ? ಉದಾಹರಣೆ ಕೊಡಿರಿ.

d. Distinguish between organic and inorganic polymers.

ಸಾವಯವ ಮತ್ತು ನಿರವಯವ ಪಾಲಮರ್‌ಗಳ ತುಲನಾತ್ಮಕ ಗುಣಧರ್ಮಗಳನ್ನು ವಿವರಿಸಿರಿ.

P.T.O.

e. What happens when furan is treated with acetic anhydride in presence of HNO_3 at low temperature? Write the reaction.

ಕಡಿಮೆ ತಾಪಮಾನದಲ್ಲಿ HNO_3 ಯ ಉಪಸ್ಥಿತಿಯಲ್ಲಿ ಅಸಿಟಿಕ್ ಅನಹೈಡ್ರೈಡ್ ಜೊತೆಗೆ ಫ್ಯೂರಾನ್ ಹೇಗೆ ವರ್ತಿಸುತ್ತದೆ ಎಂದು ಸಮೀಕರಣ ಬರೆಯಿರಿ.

f. Write the structure of hygrine.

ಹೈಗ್ರೀನ್‌ನ ರಚನಾತ್ಮಕ ಸಮೀಕರಣವನ್ನು ಬರೆಯಿರಿ.

g. How do you show the presence of pyridine ring in Nicotine.

ನಿಕೋಟಿನ್‌ನಲ್ಲಿ ಪಿರಿಡಿನ್ ರಿಂಗ್ ಇರುವದನ್ನು ಸಾಬೀತು ಪಡಿಸಿ.

h. What is keto-enol tantomerism?

ಕೀಟೋ ಇನಾಲ್ ಟಾಟೋಮೇರಿಸಂ ಎಂದರೇನು?

i. How do you convert EAA into mono carboxylic acid.

EAA ಯನ್ನು ಮೋನೋ ಕಾರ್ಬಾಕ್ಸಿಲಿಕ್ ಆಮ್ಲದಲ್ಲಿ ಹೇಗೆ ಪರಿವರ್ತಿಸುವಿರಿ.

j. What is a triple point ? Mention the number of triple points in water system.

ತ್ರಿಬಿಂದು ಎಂದರೇನು ? ನೀರಿನ ಸಿಸ್ಟಂನಲ್ಲಿ ಎಷ್ಟು ತ್ರಿಬಿಂದುಗಳಿವೆ ಎಂದು ಬರೆಯಿರಿ.

k. What is zero point energy ?

ಶೂನ್ಯ ಬಿಂದು ಶಕ್ತಿ ಎಂದರೇನು ?

l. What type of molecules show vibrational spectrum.

ಎಂತಹ ಅಣುಗಳು ವೈಬ್ರೇಷನಲ್ ಸ್ಪೆಕ್ಟ್ರಮ್‌ಅನ್ನು ತೋರಿಸುತ್ತವೆ?

SECTION - B

ವಿಭಾಗ - ಬಿ

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

ಈ ಕೆಳಗಿನವುಗಳಲ್ಲಿ ಬೇಕಾದ **ನಾಲ್ಕಕ್ಕೆ** ಮಾತ್ರ ಉತ್ತರಿಸಿರಿ.

2. What are ligands ? Explain in brief the classification of ligands.

ಲಿಗ್ಯಾಂಡ್ಸ್ ಎಂದರೇನು ? ಅವುಗಳ ವರ್ಗೀಕರಣ ಬರೆಯಿರಿ.

3. Explain in brief co-precipitation and post-precipitation.

ಕೋ-ಪೈಸಿಪಿಟೇಷನ್ ಮತ್ತು ಪೋಸ್ಟ್ ಪ್ರೆಸಿಪಿಟೇಷನ್ ಕುರಿತು ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.

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4. How is Heterocyclic compound synthesised from dieithyl malonete.

ಡೈ-ಇಥೈಲ್ ಮೆಲೋನೇಟ್‌ದಿಂದ ಹೆಟ್ರೋಸೈಕ್ಲಿಕ್ ಸಂಯುಕ್ತ ಹೇಗೆ ತಯಾರಿಸುತ್ತಾರೆ ?

5. Discuss the constitution of Nicotine (synthesis not required).

ನಿಕೋಟಿನ್‌ನ ಅಂಗರಚನೆ ಬಗ್ಗೆ ಚರ್ಚಿಸಿ (ಸಂಶ್ಲೇಷಣೆಯನ್ನು ಹೊರತುಪಡಿಸಿ).

6. The rotational spectrum of HCL shows a series of lines separated by 20.8 cm^{-1}. Find the moment of inertia and the intermolecular distance.

[Given : At.wt of H=1.008, cl = 35.5,

NA = 6.023×10^{23}, c = 3×10^{10} cm. s^{-1} and

h = 6.626×10^{-27} erg. se...]

HCL ಅಣುವಿನ ಭ್ರಮಣ ರೋಹಿತದಲ್ಲಿ ಅನುಕ್ರಮವಾಗಿ ಬರುವ ಎರಡು ರೇಖೆಗಳ ನಡುವಿನ ವ್ಯತ್ಯಾಸ 20.8 cm^{-1} ಇರುತ್ತದೆ. ಮೊಮೆಂಟ್ ಆಫ್ ಇನರ್ಷಿಯಾ ಮತ್ತು ಇಂಟರ್‌ಮಾಲೆಕ್ಯೂಲರ್ ಅಂತರವನ್ನು ಕಂಡುಹಿಡಿಯಿರಿ.

[ದತ್ತ : H ನ ಪರಮಾಣು ತೂಕ 1.008

cl ನ ಪರಮಾಣು ತೂಕ 35.5,

NA = 6.023×10^{23}, c = 3×10^{10} cm. s^{-1}

ಮತ್ತು h = 6.626×10^{-27} erg. sec]

7. Draw phase diagram and discuss the application of phase rule to Bismuth Cadmium system.

ಸ್ಥಿತಿಸೀಮಾರೇಖಾ ಚಿತ್ರದ ಸಹಾಯದಿಂದ ಬಿಸ್ಮತ್-ಕ್ಯಾಡ್ಮಿಯಂ ವಸ್ತು ವ್ಯವಸ್ಥೆಯ ಕುರಿತು ವಿವರಿಸಿ ಮತ್ತು ಅದರ ಮಹತ್ವ ತಿಳಿಸಿ.

SECTION - C

ವಿಭಾಗ - ಸಿ

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

ಈ ಕೆಳಗಿನವುಗಳಲ್ಲಿ ಬೇಕಾದ **ನಾಲ್ಕಕ್ಕೆ** ಮಾತ್ರ ಉತ್ತರಿಸಿರಿ.

8. a) What are silicones ? Give their applications.

ಸಿಲಿಕೋನ್ಸ್ ಎಂದರೇನು ? ಅವುಗಳ ಅನ್ವಯಗಳನ್ನು ಬರೆಯಿರಿ.

b) Write a note on green methods and green products.

ಹಸಿರು ಪದ್ಧತಿ ಮತ್ತು ಹಸಿರು ಉತ್ಪನ್ನಗಳ ಕುರಿತು ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.

9. a) Explain molecular orbital structure and aromaticity of pyrrole.

ಪೈರಾಲ್‌ನ ಅಣ್ವಿಕ ಕಕ್ಷಾಫಲನದ ರಚನೆ ಮತ್ತು ಅದರ ಆರೋಮ್ಯಾಟಿಸಿಟಿ ವಿವರಿಸಿರಿ.

b) Give the comparisian of basicities of pyridine, piperidine and pyrrole.

ಪಿರಿಡಿನ್, ಪಿಪೆರಡಿನ್ ಮತ್ತು ಪೈರಾಲ್‌ಗಳ ಪ್ರತ್ಯಾಮ್ಲೀಯತೆಯನ್ನು ತುಲನೆ ಮಾಡಿರಿ.

P.T.O.

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10. a) Explain hofmann exhaustiye methylation taking pyridine as an example.

ಪಿರಿಡೀನ್‌ನ್ನು ಉದಾಹರಣೆಯಾಗಿ ತೆಗೆದುಕೊಂಡು ಹಾಫ್ಮನ್‌ನ ಸಮಗ್ರ ಮಿಥೈಲೀಕರಣವನ್ನು ವಿವರಿಸಿ.

b) How is bond length and moment of inertia of a molecule determined from the rotational spectrum.

ಒಂದು ಭ್ರಮಣ ರೋಹಿತ ಅಣುವಿನ ಬಂಧ ಅಳತೆ ಮತ್ತು ಮೊಮೆಂಟ್ ಆಫ್ ಇನರ್ಷಿಯಾವನ್ನು ಹೇಗೆ ಸಾಧಿಸುವಿರಿ ?

11. a) Draw phase diagram and discuss the application of phase rule to water system.

ಸ್ಥಿತಿ ಸೀಮಾರೇಖಾ ಚಿತ್ರದ ಸಹಾಯದಿಂದ ನೀರಿನ ವಸ್ತು ವ್ಯವಸ್ಥೆಯ ಕುರಿತು ವಿವರಿಸಿ ಮತ್ತು ಅದರ ಮಹತ್ವ ತಿಳಿಸಿ.

b) What is isomerism ? Explain

i) Ionisation isomerism

ii) Optical isomerism

in coordination compounds with c.n. 4

ಐಸೋಮೇರಿಸಂ ಎಂದರೇನು ? ಉದಾಹರಣೆಯೊಂದಿಗೆ ವಿವರಿಸಿರಿ.

i) ಅಯೋನೈಸೇಷನ್ ಐಸೋಮೇರಿಸಂ

ii) ಆಪ್ಟಿಕಲ್ ಐಸೋಮೇರಿಸಂ ಕೋಆರ್ಡಿನೇಶನ್ ಕಂಪೌಂಡ್ಸ ವಿಥ್ c.n. 4

12. a) Derive an expression for the vibrational energy levels in terms of vibrational quantum number.

ವೈಬ್ರೇಷನಲ್ ಕ್ವಾಂಟಂ ನಂಬರಗಳ ರೂಪದಲ್ಲಿ ವೈಬ್ರೇಷನಲ್ ಎನರ್ಜಿ ಲೆವೆಲ್‌ಗಳನ್ನು ವ್ಯಕ್ತಪಡಿಸಿ.

b) The fundamental vibrational frequency of Hcl is 2890 cm^{-1}. Calculate the force constant of the molecule.

Hcl ಅಣುವಿನ ಮೂಲ ಕಂಪಿತ ತರಂಗಾಂತರವು 2890 cm^{-1} ಇರುತ್ತದೆ. ಹಾಗಾದರೆ ಅದರ ಬಲದ ಸ್ಥಿರಾಂಕವನ್ನು ಲೆಕ್ಕಿಸಿ.
