



35537/E370/42537

Reg. No.

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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 $\left| \int_a^b \sin x^2 dx \right| \leq \frac{1}{a}$

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) $\int_0^1 \frac{\sin x}{x} dx$

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

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

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

PART - B

Answer any **FOUR** of the following:

(4×5=20)

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

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 $\int_0^{\infty} x^n e^{-a^2 x^2} dx = \frac{1}{2a^{n+1}} \sqrt{\frac{n+1}{2}}$ 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 $\int_2^3 f(x) dx$.



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

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

10. a) If $f(x)$ and $g(x)$ are positive functions on $[a, b]$ and $x \rightarrow a \frac{f(x)}{g(x)} = l$, 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 $\sqrt{m} \sqrt{m + \frac{1}{2}} = \frac{\sqrt{\pi}}{2^{2m-1}} \sqrt{2m}$ 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 $a \leq x \leq b, c \leq y \leq d$, then prove that

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

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



35538/E380/42538

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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 initial 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.



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 $x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$.
- 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.



- 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 $y_{x+2} + 4y_x = (\text{Sin}x)2^x$
- b) Solve $y_{x+2} - 7y_{x+1} + 10y_x = 12.4^x$
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I Semester B.Sc.3/4 Degree Examination, Nov./Dec. - 2019

MATHEMATICS (Optional)

(Repeaters and Regular w.e.f.2014-15)

Algebra And Trigonometry

Paper -II

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer all questions.
2. Question paper contains three Parts namely A, B, C.

PART - A

Answer any TEN of the following:

(10×2=20)

1. a) Define symmetric and skew symmetric determinants.

b) Prove that
$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 1+x & 1 & 1 \\ 1 & 1 & 1+y & 1 \\ 1 & 1 & 1 & 1+z \end{vmatrix} = xyz$$

- c) Define elementary transformations of a matrix.

d) Find the rank of a matrix
$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & 6 & 3 \\ 3 & 13 & 4 \end{bmatrix}$$

- e) Write the condition for consistency and inconsistency of system of linear non-homogeneous equations.
- f) Define an equivalence relation.
- g) State De Morgan's law's for indexed family of sets.
- h) State factor theorem.
- i) Find the quotient and remainder on dividing $x^3 - 7x^2 + 4x + 3$ by $x - 2$.
- j) Express $\sin(x - iy)$ in $A + iB$ form.
- k) Find the general value of $\log(\sqrt{3} - i)$.

P.T.O.



1) Prove that $\log\left(\frac{a+ib}{a-ib}\right) = 2i \tan^{-1}\left(\frac{b}{a}\right)$.

PART - B

Answer any **FOUR** of the following:

(4×5=20)

2. Prove that
$$\begin{vmatrix} x+a & b & c & d \\ a & x+b & c & d \\ a & b & x+c & d \\ a & b & c & x+d \end{vmatrix} = x^3(x+a+b+c+d)$$

3. Find the rank of a matrix $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$ by reducing into normal form.

4. Test the consistency and solve $x + y + z = 6$, $2x - y + 3z = 9$ and $x - y + z = 2$.

5. Establish the relation between roots and co-efficients of $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_n = 0$.

6. Prove that the unit interval $[0,1]$ is uncountable.

7. Expand $\cos^7 \theta$ in terms of cosines of multiples of θ .

PART - C

Answer any **FOUR** of the following:

(4×10=40)

8. a) If A is a determinant of order 4 and if A^1 is its reciprocal determinant, then prove that $A^1 = A^3$, if $\Delta \neq 0$.

b) Prove that
$$\begin{vmatrix} 1^2 & 2^2 & 3^2 & 4^2 \\ 2^2 & 3^2 & 4^2 & 5^2 \\ 3^2 & 4^2 & 5^2 & 6^2 \\ 4^2 & 5^2 & 6^2 & 7^2 \end{vmatrix} = 0$$

9. a) Prove that interchange of pair of rows do not change the rank of a matrix.



b) Find the inverse of a matrix $\begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ by elementary transformations.

10. a) Prove that a subset of denumerable set is either countable or denumerable.

b) Prove that $N \times N$ is countable, where 'N' is the set of all natural numbers.

11. a) Solve the equation $6x^4 - 13x^3 - 35x^2 - x + 3 = 0$, one root being $2 - \sqrt{3}$.

b) Find the roots of an equation $4x^4 - 7x^2 - 5x + 1 = 0$ by synthetic division.

12. a) If $\cos(A - iB) = x + iy$ then prove that

i.
$$\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$$

ii.
$$\frac{x^2}{\cos^2 A} - \frac{y^2}{\sin^2 A} = 1$$

b) Find the sum of n terms of the series $\cos \alpha + \cos(\alpha + \beta) + \cos(\alpha + 2\beta) + \dots$ to 'n' terms.



- 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

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

(4×5=20)

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 $2m$ 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 $I = \int_0^1 (y'^2 + x^2) dx$ with end conditions $y(0) = 0 = y(1)$ subjected to the constraint $\int_0^1 y dx = \frac{1}{6}$.



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 $F = h^2 u^2 \left(\frac{d^2 u}{d\theta^2} + u \right)$.
- 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 $\int_0^\pi (y'^2 + 2y \sin x) dx$ 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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- 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.

ಹೈಗ್ರೀನ್ ರಚನಾತ್ಮಕ ಸಮೀಕರಣವನ್ನು ಬರೆಯಿರಿ.

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

ನಿಕೋಟಿನ್‌ನಲ್ಲಿ ಪಿರಿಡಿನ್ ರಿಂಗ್ ಇರುವುದನ್ನು ಸಾಬೀತು ಪಡಿಸಿ.

- h. What is keto-enol tautomerism?

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 ಸ್ಪೆಕ್ಟ್ರಮ್ ಅನ್ನು 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-ಪ್ರೆಸಿಪಿಟೇಷನ್ ಮತ್ತು ಪೋಸ್ಟ್-ಪ್ರೆಸಿಪಿಟೇಷನ್ ಕುರಿತು ಟಿಪ್ಪಣಿ ಬರೆಯಿರಿ.



4. How is Heterocyclic compound synthesised from diethyl malonate.

ಡೈ-ಇಥೈಲ್ ಮಲೋನೇಟ್‌ನಿಂದ ಹೆಟರೋಸೈಕ್ಲಿಕ್ 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,

$$NA = 6.023 \times 10^{23}, c = 3 \times 10^{10} \text{ cm. s}^{-1} \text{ and}$$

$$h = 6.626 \times 10^{-27} \text{ erg. se...}]$$

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,

$$NA = 6.023 \times 10^{23}, c = 3 \times 10^{10} \text{ cm. s}^{-1}$$

$$\text{ಮತ್ತು } h = 6.626 \times 10^{-27} \text{ erg. sec}]$$

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

ಬಿಸ್ಮಿಥ್-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 comparison of basicities of pyridine, piperidine and pyrrole.

ಪಿರಿಡಿನ್, ಪಿಪೆರಿಡಿನ್ ಮತ್ತು ಪೈರಾಲ್‌ಗಳ ಪ್ರತ್ಯಾಮ್ಲೀಯತೆಯನ್ನು ತುಲನೆ ಮಾಡಿರಿ.

P.T.O.



10. a) Explain Hofmann exhaustive 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 ಕೋಆರ್ಡಿನ್‌ನೇಷನ್ ಕಂಪೌಂಡ್ಸ್ ವಿಥ್ c.n. 4
12. a) Derive an expression for the vibrational energy levels in terms of vibrational quantum number.
ವೈಬ್ರೇಷನಲ್ ಕ್ವಾಂಟಂ ನಂಬರ್‌ಗಳ 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.



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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 ಒಂದೇ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆಯಿರಿ.
3. Draw neat diagram and give equations.
ಅಂದವಾದ ಆಕೃತಿಯನ್ನು ಮತ್ತು ರಸಾಯನಿಕ ಸೂತ್ರವನ್ನು ಬರೆಯಿರಿ.

SECTION - A

ವಿಭಾಗ - ಎ

1. Answer any TEN of the following.

(10x2=20)

- 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 empirical relationship for adsorption.
ಫ್ರೆಂಡ್ಲಿಚ್ ಇಂಪಿರಿಕಲ್ ಮತ್ತು ಹೊರಹೀರುವಿಕೆಯ ಸಂಬಂಧವನ್ನು ವಿವರಿಸಿ.
- f) Expand LAH and give two uses.
LAH ನ್ನು ವಿಸ್ತರಿಸಿ ಮತ್ತು ಎರಡು ಉಪಯೋಗಗಳನ್ನು ವಿವರಿಸಿ.

P.T.O.



- g) What is base peak ? Give one example.
ಒಂದು ಉದಾಹರಣೆಯೊಂದಿಗೆ ಬೇಸ್‌ಪಿಕ್‌ನ್ನು ವಿವರಿಸಿ.
- h) What are azo dyes ? Give one example.
ಅಸ್ತೋ ವರ್ಣಗಳೆಂದರೇನು ? ಅದರ ಒಂದು ಉದಾಹರಣೆ ಬರೆಯಿರಿ.
- i) Write BEQ equation and mention the terms involved in it.
BEQ ಸಮೀಕರಣವನ್ನು 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.
ಪೋರ್ಟ್ ಲ್ಯಾಂಡ್ ಸಿಮೆಂಟ್‌ನ್ನು ಬಣ ವಿಧಾನದಿಂದ ತಯಾರಿಸುವಿಕೆಯನ್ನು ವಿವರಿಸಿ.
4. Explain the preparation of Biogas. Write composition and two applications of bio gas.
ಬಾಯೋಗ್ಯಾಸ್ 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 ? ಮಲಾಕ್ಯಾಟ್ ಹಸಿರನ್ನು ಸಂಶ್ಲೇಷಿಸುವ ವಿಧಾನವನ್ನು ಬರೆಯಿರಿ.
7. Give the relation between K_p , K_c and K_x .
 K_p , K_c ಮತ್ತು K_x ನಡುವಿನ ಸಂಬಂಧಗಳನ್ನು ವಿವರಿಸಿ.



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.
ಇಲೆಕ್ಟ್ರೋ ಡಿಪೋಸಿಷನ್ ವಿಧಾನದಿಂದ ಹಿತ್ತಾಳೆ ತಯಾರಿಸುವಿಕೆಯನ್ನು ವಿವರಿಸಿ. ಹಿತ್ತಾಳೆಯ ಎರಡು ಉಪಯೋಗಗಳನ್ನು ಬರೆಯಿರಿ.
- b) Explain the manufacture of glass. Give the composition of Borosilicate glass.
ಗ್ಲಾಸ್ ತಯಾರಿಸುವ ವಿಧಾನವನ್ನು ವಿವರಿಸಿ. ಬೋರೋಸಿಲಿಕೇಟ್ 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.
ಮೇಕಿಲ್‌ಸ್ ಮೇನಟ್‌ರ್ ಸಮೀಕರಣವನ್ನು 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 Benzylic oxidation of tetralin.
DDQ ಸಂಕ್ಷೇಪಿಸಿ ಬರೆಯಿರಿ ಮತ್ತು ಟೆಟ್ರಾಲಿನ್‌ನ ಬೆಂಜೈಲಿಕ್ ಉತ್ಕರ್ಷಣದಲ್ಲಿ ಇದರ ಬಳಕೆಯನ್ನು ವಿವರಿಸಿ.
- b) Deduce Vant Hoff's reaction isotherm.
ವ್ಯಾಂಟ್ ಹಾಫ್ ಪ್ರತಿಕ್ರಿಯೆ 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.
ಲಾಂಗ್ಮ್ಯುರ್ ಹೊರಹೀರುವಿಕೆಯ ಸಮತಾಪಿಯನ್ನು ವಿವರಿಸಿ ಬಿಡಿಸಿರಿ.
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V Semester B.Sc. 4 Degree Examination, Nov./Dec. - 2019

PHYSICS(OPTIONAL)

(Regular)

Paper : I

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)

- What are the constraints? Name the types of constraints.
- State kepler's first law of planetary motion.
- What is central force?
- What are dangling bonds?
- State super position theorem.
- What is configuration space?
- State fundamental postulates of special theory of relativity.
- What is 'BARKHUSEN' criteria?
- Why FET is called a voltage controlled device?
- A rod of 1 meter long is moving along its length with a velocity $0.4C$. Calculate its length as it appears to an observer on the earth.
- A zener diode has a specified breakdown voltage of $9.0V$ with maximum power dissipation of 0.5 watt. What is the maximum current the diode can handle.
- Calculate the amplitude gain of the negative feed back amplifier when the feedback ratio is 0.1 and the gain without feed back is 90 .

PART - II

Answer any FOUR questions.

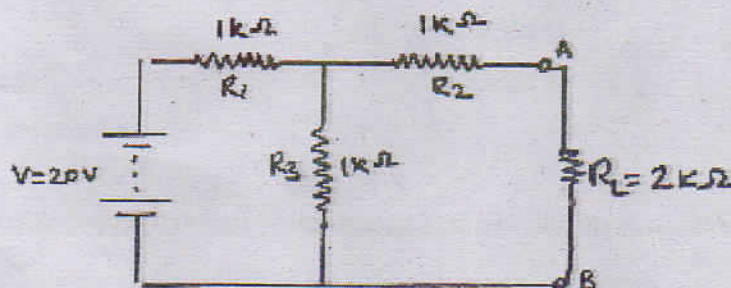
(4×5=20)

- Explain the application of Lagrange's equation in case of linear harmonic oscillator.
- Obtain relativistic formula for addition of two velocities.
- Explain with neat circuit diagram the working of F.W.Bridge rectifier.

P.T.O.



5. The period of earth is 365 days and that of Venus is 224 days. Find the ratio of the major axis of their orbits.
6. Draw the Norton's equivalent circuit for the circuit shown below. Find the current through load resistance $R_L = 2 K \Omega$.



7. A phase shift oscillator uses 5PF capacitors. Find the value of R to produce frequency of 800KHz.

PART - III

Answer any **FOUR** of the following.

(4×10=40)

8. What is generalised co-ordinates? Obtain an expression for kinetic energy.
9. Obtain an expression for the total energy of a body moving in central force field.
10. Derive Lorentz transformation equations using theory of relativity.
11. State and prove thevenin's theorem.
12. What are h-parameters? Describe the procedure to determine h-parameters of NPN-transistor in CE configuration.

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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

1. Answer any TEN questions :

(10×2=20)

- What is Compton shift?
- What is the average life time of an atom in a metastable state?
- State the orthogonal condition for wave function.
- What is degeneracy?
- What is space quantisation?
- State Pauli's Exclusion principle.
- State Larmor's precession theorem.
- Mention the types of molecular spectra.
- Show that $2J'_n(x) = J_{n-1}(x) - J_{n+1}(x)$.
- Write Hermite differential equation.
- If the uncertainty in the position of an electron is $4 \times 10^{-10} m$, calculate the uncertainty in the momentum.
- Calculate Lande's g factor for $2S_{1/2}$ state.

PART - II

Answer any FOUR questions :

(4×5=20)

- Illustrate uncertainty principle by Gamma ray microscope.
- Give the Physical significances of wave function.
- Outline the theory of anomalous Zeeman effect.

P.T.O.



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



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PART - III

Answer any FOUR of the following.

(4×10=40)

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 9. Derive an expression for energy of a particle in one dimensional box. Show the energy levels and wave functions.
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 11. Derive an expression for the energy of a diatomic molecule as a rigid rotator.
 12. Derive the orthogonality of Bessel's function.
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V Semester B.Sc. 4 Degree Examination, Nov./Dec. - 2019

COMPUTER SCIENCE(Optional)

(Relational Database Management System)

(Regular)

(2017-18 onwards)

Paper : I

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

- i) Answer all Sections.
- ii) Draw neat diagram wherever necessary.

SECTION - A

1. Answer **ALL** questions. Each carries 2 marks. (10×2=20)
- a) Define RDBMS.
 - b) What schema and Instance.
 - c) Define attribute? Give example.
 - d) What is relational algebra.
 - e) What is tuple? Give an example.
 - f) List out four cardinality Ratios of binary relation.
 - g) Write the syntax for CREATE COMMAND.
 - h) What is data storage.
 - i) What is RAID
 - j) What is the need of NULL VALUES.

SECTION - B

- Answer any **FOUR** question. Each carries 5 marks. (4×5=20)
2. Explain the actors behind the scene.
 3. Explain three schema architecture with diagram.

P.T.O.



4. Explain DDL and DML.
5. Write the advantages and disadvantages of Hashing.
6. What is functional Dependency? Give an example.

SECTION - C

Answer any **four** questions. Each carries **10** marks.

(4×10=40)

7. Define the following.
 - a) Primary key
 - b) Foreign key
 - c) Composite key
 - d) Superkey
 - e) Alternate key.
 8. Draw and explain E-R diagram for Bank database.
 9. Define Normalisation? Explain 1NF, 2NF and 3NF
 10. Explain the following.
 - a) SELECT
 - b) UPDATE
 - c) DELETE
 - d) DROP.
 - e) ALTER.
 11.
 - a) What is JOIN? Explain different types of SQL JOIN
 - b) Explain different database locking techniques.
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V Semester B.Sc. 4 Degree Examination, Nov./Dec. - 2019

COMPUTER SCIENCE

(OPTIONAL) (Regular)

Object Oriented Programming Using Java

(2017-18 onwards)

Paper : II

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

- 1) Answer all Sections.
- 2) Draw neat diagram wherever necessary

SECTION - A

1. Answer **ALL** questions. Each carries 2 marks. (10×2=20)
- a) What is object?
 - b) Define Data Abstraction.
 - c) Explain how to access the members of a class.
 - d) When do we declare a method or a class abstract?
 - e) What is String? Name the method used to find the length of a string.
 - f) Write the significance of super keyword.
 - g) Write the importance of finally block in Exception Handling.
 - h) What is a stream?
 - i) Expand awt
 - j) Name any two classes of awt package.

SECTION - B

- Answer any **FOUR** questions. Each carries 5 marks. (4×5=20)
2. Explain Encapsulation and polymorphism.
 3. Explain the static members of a class.
 4. Write a Java program to demonstrate the concept of method overloading.

P.T.O.



5. Explain Exception Handling with syntax and e.g.
6. Explain the importance of component class in awt hierarchy.

SECTION - C

Answer any **FOUR** questions. Each carries **10** marks.

(4×10=40)

7. Explain the features of Java.
 8. Write a Java program to sort the elements using bubble sort.
 9. Name the different access modifiers used in Java.
 10. Explain the concept of multithreading.
 11. Write short note on
 - a) User defined package
 - b) Decision making statements.
-