42542/E420

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

V Semester B.Sc.4 Degree Examination, March/April - 2021
PHYSICS (Optional)
Paper : I
(Regular-New Syllabus-W.E.F. 2019-20)

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

Instructions to Candidates :

Calculators are allowed for calculations write intermediate steps.

PART - I

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

1. a) What are degrees of freedom?
   b) What is configuration space?
   c) What is size effect?
   d) Define frame of reference.
   e) What is time dilation?
   f) What is the internal resistance of an ideal voltage source?
   g) What is Zener diode? Draw its circuit symbol.
   h) What is positive feed back?
   i) Mention the basic condition of an oscillator.
   j) Write any two differences between JFET and BJT transistor.
   k) Find the amount of energy produced by converting a matter of mass 0.24 kg (in ev).
   l) If the input power of a rectifier is 80w and rectification efficiency is 80.2%. Find its output power.

PART - II

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

2. Explain the principle of virtual displacement and virtual work.
3. Write a note on nano particles.
4. Derive Einstein's mass energy relation.
5. The ratio of semi-major axis of a planet "A" to that of a planet B is 2.5. If the period of revolution of the planet A is 4.2 years, find the period of revolution of the planet B around the given star.

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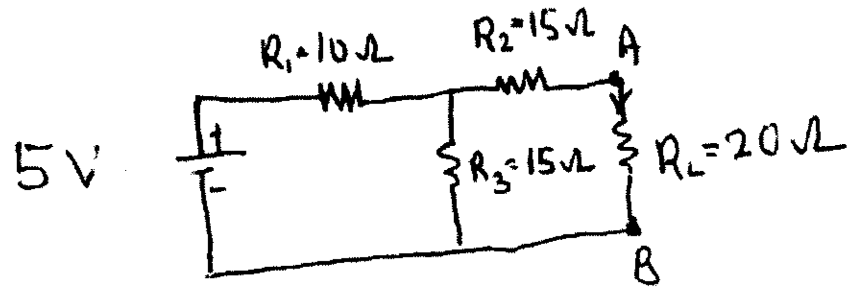
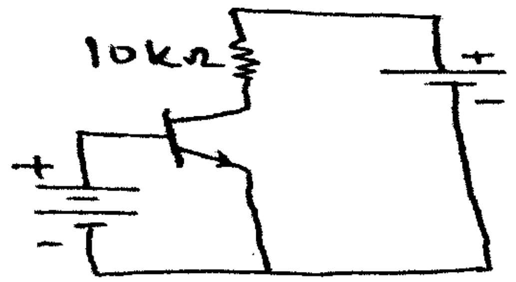
6. Using Thevenin's theorem find the current through below load resistance $R_L = 20\Omega$ in the circuit given below.



7. In the following circuit, voltage drop across the collector resistance is 4 Volt. Calculate the base current, gain of transistor in in CE mode. (Given: $\alpha = 0.99$)



PART - III

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

8. Derive Lagrange's equation of motion from D'Alembert's principle.
9. State Kepler's Laws of planetary motion. Derive the second Keplers's law using Lagrange's equation of motion.
10. State the postulates of special theory of relativity. Derive the Lorentz transformation equations.
11. a) What is rectifier? With neat circuit diagram. Explain the wotking of Bridge - rectifier.
    b) Derive the equation for rectifier efficiency.
12. a) Explain the working of FET as a source amplifier.
    b) Discuss the parameters of FET.

42526/35526/E260

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

V Semester B.Sc. 4/3 Degree Examination, March/April - 2021

CHEMISTRY (Optional)

Paper - II

(Regular&Repeater)

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

Instructions to Candidates :

1. All questions are compulsory
2. Answer all question in the same answer book.
3. Draw neat diagram & give equation wherever necessary.

SECTION - A

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

1. a) Mention any two types of alloy's with example.

b) What is composition of cement? Mention it's types.

c) Write any two application of natural abrasives.

d) Write any two characterisitcs of fuels

e) How DDQ is prepared.

f) What are dyes?

g) Expand LAH and give two uses.

h) What are azo dyes.

i) Explain heterogeneous catalysis with example.

j) Write Van't Hoff's reaction isotherm.

k) What are chain transfer reaction.

l) Give one example when K_p becomes equal to K_c.

SECTION - B

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

2. Explain the manufacture of water gas with neat labelled diagram give it's application.

3. Discuss two application of

i. Ferrous alloy's

ii. non - ferrous alloy's

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4. Give the mechanism of oxidation of 1,2 - diol using lead tetra-acetate
5. Write the mechanism of formation of Amide by using DCC.
6. Deduce the relationship between K_p, K_c, and K_x.
7. Write any five difference between physical adsorption and chemical adsorption.

SECTION - C

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

8. a) How is brass manufactured by electro - deposition method? Give two uses of brass.
   b) Explain the manufacture of glass. Give the composition of Boro silicate glass.
9. a) Derive Michaelis - Menten equation.
   b) How is white lead manufactured? Give it's application.
10. a) Write a note on general aspects of chain reaction.
    b) Derive langmuir adsorption isotherm.
11. a) Explain Witt's theory of colour and constitution of dyes.
    b) Explain manufacture and application of carborundum.
12. a) How is NBS prepared? Write the mechanism of allylic bromination using NBS.
    b) Explain the steps involved in the mechanism of chain reaction with suitable example.

35537/42537/E370

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

V Semester B.Sc. 3/B.Sc. 4 Degree Examination, March/April - 2021

MATHEMATICS (OPTIONAL)

Paper - I : Real Analysis

(Repeaters/Regular)

(w.e.f. 2016-17)

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 upper and lower Riemann integrals.

b) Prove that $L(P,F) \leq U(P,F)$.

c) State first mean value theorem of integral calculus.

d) Prove that $\left|\int_1^2 \frac{\sin x}{x} dx\right| \leq 2$.

e) Discuss the convergence of $\int_1^\infty \frac{dx}{(5+x)\sqrt{x}}$.

f) Test the convergence of $\int_0^{\frac{\pi}{2}} \frac{dx}{\sqrt{\tan x}}$.

g) Prove that $\beta(1,1) = \Gamma 1$.

h) Prove that $\Gamma n = \int_0^1 \left[\log\left(\frac{1}{x}\right)\right]^{n-1} .dx$.

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i) Evaluate $\int_0^{\frac{\pi}{2}} \cos^7 x dx$ by Beta-Gamma function.

j) State Cauchy's test of convergence for improper integral.

k) Evaluate $\int_1^2 \int_3^4 x^3 y^3 dxdy$.

l) Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yzdxdydz$.

PART - B

Answer any **FOUR** of the following: **(4ч5=20)**

2. If $f(x)$ and $g(x)$ are bounded and integrable in $[a,b]$ then prove that $f(x).g(x)$ is bounded and R-integrable in $[a,b]$.

3. State and prove Fundamental theorem of integral calculus.

4. If $f(x)$ and $g(x)$ are positive in $[a,\infty]$ and $\lim_{x\to\infty} \frac{f(x)}{g(x)} = l$ (non-zero finite) then prove that the integrals $\int_a^\infty f(x)dx$ and $\int_a^\infty g(x)dx$ behave alike.

5. Test the convergence of $\int_0^{\frac{\pi}{2}} x^m . \operatorname{cosec}^n x dx$.

6. Show that $\int_0^a x^4 \sqrt{a^2 - x^2} dx = \frac{\pi a^6}{32}$.

7. Find volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ by using triple integration.

PART - C

Answer any **FOUR** of the following: **(4Ч10=40)**

8. a) State and prove condition of R-integrability.

b) Prove that $f(x) = 2x + 4$ is integrable on $[1,2]$ and $\int_1^2 (2x+4)dx = 7$.

9. a) State and prove Wiestrass form of second mean value theorem of integral calculus.

b) Prove that $\frac{\pi^3}{24} \le \int_0^{\frac{\pi}{2}} \frac{x^2}{5+3\cos x} dx \le \frac{\pi^3}{6}$.

10. a) State and prove Abel's test for the convergence of an improper integral.

b) Test the convergence of $\int_0^\infty \sin x^2 dx$.

11. a) Define Beta and Gamma function and establish the relation between them.

b) Prove that $\int_0^\infty x^2.e^{-x^4} dx.\int_0^\infty e^{-x^4} dx = \frac{\pi}{\sqrt[8]{2}}$.

12. a) State and prove Leibnit'z theorem for differentiation under integral sign.

b) If $|a| < 1$ Show that $\int_0^\pi \frac{\log(1+a\cos x)}{\cos x}.dx = \pi \sin^{-1} a$.

35538/42538/E380

Reg. No. [ ]

V Semester B.Sc. 3/B.Sc. 4 Degree Examination, March/April - 2021

MATHEMATICS

Paper - II: Numerical Analysis

(Regular and Repeaters w.e.f. 2016-17)

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

Instructions to Candidates:

1. Answer all questions.
2. Students are allowed to use Scientific Calculators.

PART - A

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

1. a) Find a real root of the equation $x^3 - x - 1 = 0$ using bisection method in two stages.

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

 c) With usual notation prove that $E = 1 + \Delta$

 d) Construct the forward difference table $x^3 + x^2 - 2x + 1$ for the value of $x = 0,1,2,3$.

 e) Evaluate $\Delta^6\{(1+2x)(1-3x)(1+4x)\}$, where n = 1

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

 g) State Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ formula 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 $\frac{dy}{dx} = 2y + e^x$, y(0)=0.

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

 j) Find the order and degree of difference equation $y_{n+3} + 3y_{n+2} + 6y_{n+1} - 4y_n = 1$

 k) From the difference equation by eliminating a and b from the relation $yn = (an+b)3^n$

 l) Show that $u_x = c_1e^{\alpha x} + c_2e^{-\alpha x}$ is a solution of $u_{x+1} - 2u_x \cosh\alpha + u_{x-1} = 0$

P.T.O.

PART - B

II. Answer any **FOUR** of the following questions. **(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 $x^4-12x^3+24x^2-30x+9$ and its successive differences in factorial notation h=1.

4. State and prove 'General Quadrature formula' for equidistant ordinate and hence deduce Trapezoidal rule from it.

5. Evaluate $\int_4^{5.2} \log x dx$ by using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule.

6. Determine the value of y, when $x = 0.1$ given that y(0) the equation $\frac{dy}{dx}=x^2+y$ by taking h=0.05 using modified Euler's method.

7. Solve $y_{x+2}-8y_{x+1}+15y_x=3^x+e^{3x}$

PART - C

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

8. a) Derive Newton-Raphson formula, $x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}$

   b) Find the real root of the equation $x^3+x+s=0$ correct to three decimal places. Using Bisection method.

9. a) State and prove Lagrange's inter polation formula for unequal interval.

   b) Find the Polynomial of 3rd degree which takes the following values.

x	3	4	5	6	7
f(x)	6	24	60	120	210

10. a) State and prove Newton-Gregory forward interpolation formula.

b) Find $f'(22)$ and $f''(22)$ given the following table.

x	1.4	1.6	1.8	2.0	2.2
$f(x)$	4.0552	4.9530	6.0496	7.3891	9.0250

11. a) Explain Picards method to solve the equation $\frac{dy}{dx} = f(x, y)$ with initial Condition $y(x_o) = y_o$

b) Find the approximate solution at $x = 1.2$ of the equation $\frac{dy}{dx} = xy$ given by y(1)=2 by Runge-Kutta method taking h=0.2

12. a) Solve $u_{x+2} - 3u_{x+1} - 4u_x = 3^x$

b) Solve $y_{x+2} + 4y_x = 2^x.(\text{Sin } x)$