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Sl.No. 2074

Total No. of Pages : 2

IV Semester B.Sc. Examination, May/June - 2017

(Scheme: SS)

PHYSICS (Paper - IV)

Electricity and Electromagnetism

(2014-2015 Batch onwards)

Time : 3 Hours

Max. Marks : 60

Instructions :

Answer any three questions from Part - A and B, three questions from Part - C and six questions from Part - D.

PART - A

1. a) Obtain an expression for the mechanical force and electrical pressure on a charged surface [6]
b) Give the theory of ballistic galvanometer. [6]
2. a) Define power factor in electrical circuit. Obtain an expression for power in LR circuit. [7]
b) With necessary circuit diagram explain the action of Robinsons bridge. [5]

PART - B

3. a) What is a low pass filter? Discuss the frequency response of a low pass RC filter and obtain an expression for its cut off frequency. [6]
b) Explain peltier and thomson effects. [6]
4. a) Describe how electromagnetic waves can be produced and detected by hertz experiment. [6]
b) State and explain gauss's divergences theorem. [3]
c) Explain the measurement of A.C. voltage using CRO. [3]

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PART - C

5. Calculate the force of attraction between the plates of an attracted disc electrometer when potential difference of 2500V is applied between them. The distance between the plates is 0.5×10^{-2} m the area of cross section is 10^{-3} m². [4]
6. A coil of resistance 60Ω and inductance 3 henry is connected in series with a capacitor of $4\mu\text{F}$ and an a.c. supply of 200 volts and 50c/s. Calculate [4]
 i) The impedance of the circuit.
 ii) The phase difference between current and voltage.
7. If $\vec{P} = x^2 y \hat{z} + y^2 z \hat{j} + z^2 x \hat{k}$ then find $\text{div. } \vec{P}$ at $(-1,1,1)$ [4]
8. If the magnitude of the electric field is 376 v/m. Find the magnitude of magnetic field and the energy density. [4]

PART - D

Answer any six questions

9. a) What is the principle involved in the working of an attracted disc electrometer? [2]
 b) Define current sensitivity and charge sensitivity in a moving coil galvanometer. [2]
 c) Draw the variation of magnetic field with distance in case of helmholtz double coil galvanometer. [2]
 d) Write the circuit diagram of maxwells bridge. [2]
 e) Give the significance of gradient of scalar point function. [2]
 f) State and explain law of intermediate metals. [2]
 g) What is pointing vector? [2]
 h) Set up maxwells equation $\nabla \cdot \vec{D} = \rho$ [2]



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Sl.No. 1996

Total No. of Pages : 3

IV Semester B.Sc Examination, May/June - 2017

(Semester Scheme)

MATHEMATICS (Paper - IV)

Differential equations - II and Integral Calculus - II

Time : 3 Hours

Max. Marks : 60

Instructions : Answer all the Sections.

SECTION - A

1. Answer any six questions. Each question carries. Two marks.

- a) Verify that $y = e^{2x}$ is a solution of $x y'' - (1+x) y' + 2(1-x) y = 0$
- b) Verify the condition for integrability $yz dx - 2xz dy + (xy - zy^3) dz = 0$
- c) Form a partial differential equation by eliminating 'a' and 'b' from $ax^2 + by^2 + z^2 = 1$
- d) solve $p + q = pq$
- e) Evaluate $\int (x+y) dx + (y-x) dy$ along $x = 9t + 3$ and $y = 6t + 5$ where $0 \leq t \leq 1$.
- f) Evaluate $\int_1^2 \int_0^{3y} y dx dy$.
- g) Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$
- h) Compute the volume bounded by the sphere of radius R using spherical co-ordinates.

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SECTION - B

(Differential Equations - II)

2. Answer any six questions each question. Carries Four marks.

a) Solve $(1+x^2)^2 \frac{d^2y}{dx^2} + 2x(1+x^2) \frac{dy}{dx} + y = 0$ using the transformation.

$$Z = \tan^{-1}x.$$

b) Solve $\frac{d^2y}{dx^2} + y = \text{Cosec } x$ by the method of variation of parameters.

c) Show that the equation $x^2 \frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 2x$ is exact and solve.

d) Solve $\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$

e) Solve $p - q = x^2 + y^2$

f) Form the partial differential equation given $Z = f(x + ay) + g(x - ay)$

g) Use charpit's Method to solve $z = pq$

h) solve $\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = e^{x+2y}$

SECTION - C

(Integral Calculus - II)

3. Answer any six. Each question carries four marks.

a) Compute $\int xy \, dx + xz \, dy + xyz \, dz$ with $x = e^{-t}$, $y = e^t$, $z = t^2$, $0 < t < 1$

- b) Compute $\int_c (x + 2y) dx + (u - 2x) dy$ around the square $(0, 0), (1, 0), (1, 1)$ and $(0, 1)$
- c) Evaluate $\int_0^4 \int_{\frac{x^2}{4a}}^{\sqrt{ax}} dy dx$.
- d) Evaluate $\int_0^1 \int_{x^2}^{\sqrt{x}} xy(x + y) dy dx$ by changing the order of integration.
- e) Find the area of the surface $Z = \sqrt{x^2 + y^2}, \frac{1}{4} < x^2 + y^2 < 1$
- f) Evaluate $\int_0^1 \int_0^{1-z} \int_0^{z^2} x dx dy dz$
- g) Evaluate $\int_0^m \int_0^{\sqrt{m^2-x^2}} \int_0^{\sqrt{m^2-x^2-y^2}} \frac{dz dy dx}{\sqrt{m^2-x^2-y^2-z^2}}$
- h) Find the volume of tetrahedron bounded by the planes $x = 0, y = 0, z = 0$ and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$



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Total No. of Pages : 4

IV Semester B.Sc Examination, May - June - 2017

(Semester Scheme)

MATHEMATICS (Paper - IV)

Algebra and Differential Equations

(Prior to 2014 - 15 Batch)

Time : 3 Hours

Max. Marks : 80

Instructions to Candidates :

- 1) Section A is Compulsory.
- 2) Answer any five questions from Section B and C choosing atleast two from each section.
- 3) All questions in Sections B and C carry equal marks.

SECTION - A

1. Answer any ten questions. Each question carries two marks.

- a) In a group $(G, *)$ prove that $(ab)^{-1} = b^{-1} a^{-1}$, $\forall a, b \in G$.
- b) In a multiplicative group $G = \{1, w, w^2\}$ of cube roots of unity, find the order of 1, w and w^2 .
- c) Define a cyclic group. Give an example.
- d) In \mathbb{Z} , $*$ is defined as $a * b = a + b + 1$, find the identity element.
- e) Define homomorphism between two groups and give an example.
- f) If $f : G \rightarrow G^1$ is a homomorphism from the group G into a group G then prove that $f(a^{-1}) = [f(a)]^{-1}$.
- g) If $f : G \rightarrow G^1$ is an isomorphism and G is an abelian group then prove that G^1 is also an abelian.

h) If $f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 2 & 4 \end{pmatrix}$ $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 2 & 3 \end{pmatrix}$ find $g \circ f$.

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- i) Solve: $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$
- j) Find the order and degree of the differential equation :
 $\left(\frac{d^3y}{dx^3}\right)^{\frac{4}{3}} + \left(\frac{dy}{dx}\right)^3 + 3y = 0$
- k) Solve : $(D^3 - 13D + 12)y = 0$, where $D = \frac{d}{dx}$
- l) Find the integrating factor of $(x+1) \frac{dy}{dx} - y = e^x(x+1)^2$.
- m) Find the orthogonal trajectories of the family of curves $x^2 + y^2 = a^2$ where 'a' is a parameter.
- n) Solve : $P^2 = a^2 x^4$ Where $p = \frac{dy}{dx}$.
- o) Find the general and singular solution of the equation $y = px - p^2$ where
 $P = \frac{dy}{dx}$.

SECTION - B

(Algebra)

2. a) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a * b = \frac{ab}{2} \forall a, b \in \mathbb{Q}^+$.
- b) List all the subgroups of the group $\{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7.
- c) Show that the multiplicative group $\{1, 3, 4, 5, 9\} \pmod{11}$ is a cyclic group and find its generators.

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3. a) If G is a group and H is a subgroup of index 2 in G , show that H is a normal subgroup of G .
- b) Verify whether the permutation $(1\ 2)(3\ 4\ 5)(6\ 5)(8\ 9\ 1)$ is even or odd. Also find its order.
- c) Prove that any two right cosets of a subgroup H of a group G are either disjoint or identical.
4. a) Define a subgroup of a group g prove that intersection of any two subgroups is a subgroup of G .
- b) Prove that $f : (R, +) \rightarrow (C^*, \cdot)$ defined by $f(x) = \cos x + i \sin x, \forall x \in R$ and C^* the set of all non zero complex numbers is a homomorphism and hence find its kernel.
- c) Show that a cyclic group of order 4 is the homomorphic image of a cyclic group of order 8.
5. a) If G is a finite group and H is a subgroup of G , then prove that the order of H divides the order of G .
- b) If G is a group and H is a normal subgroup of G , then prove that G/H is a homomorphic image of G with H as its kernel.
- c) If $G = \{a + b\sqrt{7} / a, b \in Q\}$ show that $f : (G, +) \rightarrow (G, +)$ defined by $f(a + b\sqrt{7}) = a - b\sqrt{7}$ is an isomorphism.

SECTION - C

(Differential Calculus)

6. a) Solve : $\frac{dy}{dx} = \sin(x+y)\sin(x-y)$
- b) Solve : $(x + 2y)(dx - dy) = dx + dy$
- c) Solve : $\frac{dy}{dx} + y \sec x = \tan x$

7. a) Solve : $(4x + 3y + 1) dx + (3x + 2y + 1) dy = 0$

b) Solve : $x \frac{dy}{dx} + (1-x) y = x^2 y^2$

c) Find the orthogonal trajectories of the family of cardioids $r = a(1 + \cos \theta)$

8. a) Solve : $y = Px + \frac{P}{x}$ by using the substitution $x^2 = u, y^2 = v$ where

$$P = \frac{dy}{dx}$$

b) Solve $xy(p^2 + 1) = (x^2 + y^2)p$ where $P = \frac{dy}{dx}$

c) Solve $16x^2 + 2p^2y - P^3x = 0$ where $P = \frac{dy}{dx}$

9. a) Solve $(D^3 - 3D^2 + 4D - 2) y = e^x$

b) Solve $(D^2 + 4) y = \sin^2 x + e^{2x}$

c) Solve $(D^2 - 6D + 9) y = e^{3x}(x^2 + 7x + 5)$



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Total No. of Pages : 2

IV Semester B.Sc. Examination, May/June - 2017
(Semester : Scheme) (New) (2013-14 Batch Onwards)

COMPUTER SCIENCE (Paper - IV)

Analysis and Design of Algorithms

Time : 3 Hours

Max. Marks : 60

Instructions :

Answer any two full questions from each part. Each question carries
10 marks

Part - A

1. i) How do you measure the performance of an algorithm. [4]
ii) Explain different asymptotic notations. [6]
2. i) Explain the steps involved in mathematical analysis of recursive algorithms. [5]
ii) Write an algorithm to implement Bubble sort. [5]
3. i) Develop an algorithm to implement Brute Force technique. [5]
ii) Derive the time complexity of selection sort algorithm. [5]

Part - B

4. i) Write the advantages and disadvantages of merge sort and mention its applications. [5]
ii) Develop an algorithm to implement Binary Search. using divide and conquer approach. [5]
5. Explain quick sort technique and derive its time complexity. [10]

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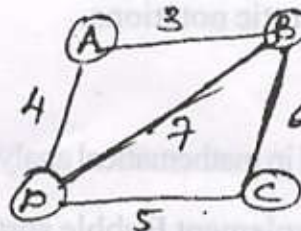
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6. i) Explain Decrease and conquer approach in detail. [6]
ii) Differentiate Depth First Search and Breadth First Search technique. [4]

Part - C

7. i) Define Heap and reaction its advantages. [4]
ii) Write an algorithm to implement Heap sort. [6]
8. Explain Gauss Elimination method with time complexity. [10]
9. Find the minimum spanning tree for the following graph using Kruskal's technique. [10]



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