

CS

Teacher's Signature

Subject: Introduction to Computing

Course Code: (1CS101)

M.M.: 20 Marks

Time: 2 Hours

- Instructions:
- All questions are compulsory.
 - Write all parts of each question at one place.

Q1. (a) What are keywords, header files and their roles in C programming language? Explain with example. [1 mark]

(b) Explain logical and Bitwise operators with suitable examples. [1 mark]

Q2 (a) What is iteration? How it is incorporated with loop in C Programming. Explain with example [2 marks]

(b) Draw a flow chart with proper notation to determine the given year is leap year or not. [1 mark]

Q3. (a) Write a program in C to check if given three side lengths constitute a triangle or not. [2 marks]

(b) Determine the hierarchy of operations showing the case study for resolving conflicting operations using associativity and stepwise evaluation of the following expression: (x is integer) [1 mark]

$$x = 4/4 + 2 * 3/4 + 8 - 2 - 5/8;$$

Q4. (a) Write a program in C to check whether a number inputted by the user is odd or even without using modulus operator. [2 marks]

(b) Write a program to compute simple interest. Principle amount, number of years and rate of interest will be inputted by the user. [2 marks]

Q5. (a) Write a program in C to input three numbers X, Y and Z, and then swap smallest number with largest number. [2 marks]

(b) Write a program in C to count number of digits in an +ve integer entered by the user and find out sum of digits. [2 marks]

Continued ...

Q6. (a) Write a program in C to input a character from user and then check if the entered character is a vowel or consonant using switch case. [2 marks]

(b) Write a program in C to print following pattern up to n^{th} term. ($n > 3$, n is inputted by user) [2 marks]

n n
n-1*n-1
n-2**n-2
***.
. .
3 3
2 2
1******(n times)1
1******(n times)1
2******(n-1 times)2
3 3
. .
n-2**n-2
n-1*n-1
nn

END

Department of Computer Sc. and Engineering
National Institute of Technology, Patna

Mid Semester Examination-Even Sem - 2014

Subject : Introduction to computing
Duration : 2 Hrs

Semester: 2nd (B1+B2+B3)
Full Marks: 30

Subject Code: CS 101

Accompany your code with sufficient comments
All Questions are Compulsory

- 1.
- a. Distinguish between Variables and Constants in C programming language. Give at least one illustrative example where a programmer will user constants. Discuss different types of variables in C programming language. [3]
 - b. Draw a Flow chart and write corresponding program in C programming language to print the largest of the four numbers to be input by user. [2+5]

2.

- a. What are the different types of operator in C programming language? Explain usage of each of the operator using one illustrative example. [1.5]
- b. Why do we need to have different data types in C programming language, why is it not a better idea to use single type variable for all types of data. [1.5]
- c. Draw a Flow chart and write corresponding C program to print the all Armstrong number between 0 and 1000. (Armstrong number is a number such that $abc = a^3 + b^3 + c^3$). [7]

3.

- a. What is an array? What are the important properties of an Array? How an array is declared, Initialized and accessed. Illustrate presence of an integer array of size 10 in the memory with memory address label to each element. [3]
- b. Write a program in C to print the following. [7]

1
2 4
3 6 9
4 8 12 16
5 10 15 20 25

NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
B.TECH II SEMESTER MID EXAMINATION-2016

Subject: Introduction to Computing
Max. Marks: 20

Sub. Code: CS 101
Time: 2 Hours

Note:-Answer any four questions. All questions carry equal marks.

1. (a) What are bit-wise operators in C? Explain with example programs. **3 marks**
(b) Explain Data types, Tokens and Identifiers in C with examples. **2 marks**

2. (a) Write a program in C to find the second largest number among three numbers input, using *if-else*. **3 marks**
(b) Write a program that checks whether a character entered by the user is a vowel or not using *Switch* and *break* statements. **2 marks**

3. (a) Write a program to input five numbers through the keyboard. Compute and display the addition of even numbers and product of odd numbers. **3 marks**
(b) Write a program to take a integer number from the keyboard and then find the sum of its all digits. **2 marks**

4. (a) Write a program in C for find addition of two 3x3 matrices. **3 marks**
(b) Write a program in C to print multiplication of digits of any number using loop. **2 marks**

- 5.(a) Write a program in C to take 50 numbers from the user and store it in array, afterward user will enter one more number, find all the locations of that number in an array of 50 numbers if present. **3 marks**
(b) Write a program in C to implement following string funtions: **2 marks**
 - I. strlen
 - II. strrev

Department of Computer Science and Engineering
National Institute of Technology Patna
Mid Semester Examination – Odd Sem, September 2016
A1/A2/A3/B.Arch 1st Sem

Subject: Introduction to Computing
Code: 1CS101

F.M:20
Time: 2hrs

Answer ALL questions. There are two pages in this question paper.

1. Explain logical and relational operators with example. [3 marks]
 2. What is the output of the following code:

(a) [1 mark]

```
#include<stdio.h>
main( ){
    int a = 300, b, c ;
    if ( a >= 400 )
        b = 300 ;
    c = 200 ;
    printf ( "\n%d %d", b, c )
```

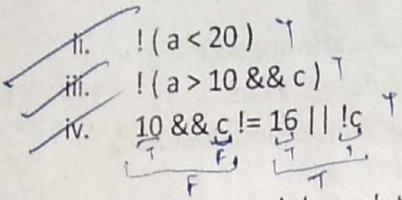
~~(b) [1 mark]~~

```
#include<stdio.h>
main( ){
    int x = 10, y = 20 ;
    if ( x == y ) ;
    printf ( "\n%d %d", x, y ) ;
```

[1 mark]

```
#include<stdio.h>
main( ) {
    int i = 1, j = 1 ;
    for ( ; ; ){
        if ( i > 5 )
            break ;
        else
            j += i ;
        printf ( "\n%d", j ) ;
        i += j ;
    }
}
```

3. If $a = 20$, $b = 24$, $c = 0$, classify the following expressions as True or False (2 marks):
i. $a == 18 \text{ || } b < 6$



4. (a) A number is entered through the keyboard. Write a program in C to obtain the reversed number. [2 marks]

(b) A certain grade of steel is graded according to the following conditions:

- (i) Hardness must be greater than 50
- (ii) Carbon content must be less than 0.7
- (iii) Tensile strength must be greater than 5600

The grades are as follows:

Grade is 10 if all three conditions are satisfied

Grade is 9 if conditions (i) and (ii) are satisfied

Grade is 8 if conditions (ii) and (iii) are satisfied

Grade is 7 if conditions (i) and (iii) are satisfied

~~Grade is 6 if only one condition is satisfied~~

~~Grade is 5 if none of the conditions are satisfied~~

Write a program, which will require the user to give values of hardness, carbon content and tensile strength of the steel under consideration and output the grade of the steel. [2 marks]

5. (a) Two numbers are entered through the keyboard. Write a program to find the value of one number raised to the power of another. You are not allowed to use math library functions for this program. [2 marks]

- (b) Write a program for a matchstick game being played between the computer and a user. Your program should ensure that the computer always wins. Rules for the game are as follows: [3 marks]

- There are 21 matchsticks. Each player can pick 1, 2, 3 or 4 matchsticks.
- The player starts first.
- After the person picks, the computer does its picking.
- This repeats until the matchsticks are exhausted. Whoever is forced to pick up the last matchstick loses the game.

Hint for winning strategy: The computer should ensure that total matchsticks picked after its turn are always a multiple of 5.

6. Write a C program to print all prime numbers from 1 to 300. (Hint: Use nested loops, break and continue)[3 marks]

Department of Computer Science and Engineering
National Institute of Technology Patna
End Semester Examination – Odd Sem, July-Dec 2016

A1/A2/A3/B.Arch 1st Sem

Subject: Introduction to Computing
Code: 1CS101

F.M:70

Time: 3hrs

Answer ALL questions. There are two pages in this question paper.

This is page II. Page I should have already reached you by now.

~~Q5.~~ (a) WAP in C to create a structure called USER to hold name, age, place and account number. Write the code to print the following – [5 marks]

- I] Name of the user(s) whose name starts with “a”.
- I] Name of the user(s) whose age is less than 30.

~~C~~ (b) Accept a list of 50 marks ranging from 0 to 100 (through keyboard form user). Using switch case, give option to print the number of students – [5 marks]

- a. Who have obtained more than 80 marks,
- b. Who have obtained 40 or less marks,
- c. In the range 61 to 80,
- d. In the range 0 to 40.

~~Q6.~~ (a) WAP in C with the following signature:

int compareStr(char *str1, char *str2)

~~WAP~~

It should return 1 if string str2 is a substring of str1, and -1 otherwise. [5 marks]

(b) WACP to read contents of a file “A.txt”. Filter out all alphabets and write them to another file “B.txt” [5 marks]

~~Q7.~~ (a) WACP to find if a given 3*3 matrix (entered from keyboard) is skew symmetric. A matrix A is skew symmetric if it satisfies:

$$-A = A^T$$

Where A^T is the transpose of matrix A [5 marks]

(b) WACP to print the following pattern: [5 marks]

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NATIONAL INSTITUTE OF TECHNOLOGY PATNA
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
END SEM EXAM 2015
2nd SEM BTech (CSE, IT)
2CS101 INTRODUCTION TO COMPUTING

TIME- 3 HOURS

MAX MARKS- 70

Answer any five from Question 1 to 6 and Question 7 is Mandatory

1. (a) What is cache memory? Why is it necessary? [4]
- (b) Explain 1's complement and 2's complement methods for subtraction. What are the advantages of 2's complement representation over to 1's complement representation? Compare them for the following operation: $(25_{10} - 49_{10})$. [8]
2. (a) Explain automatic type conversion in C with an example. [4]
- (b) Write a program that accepts the current date and the date of birth of the user. Then calculate the age of the user and display it on the screen. The age should consist of years, months and days (Age is, 71 years, 5 months, 20 days). Note that the date should be displayed in the format specified as: dd/mm/yyyy [8]
3. (a) What is the difference between scanf() with %s and gets()? Explain with an example. [4]
- (b) Write a menu driven program to perform following operations in an array:
 - a. Store a list of integer number given by user.
 - b. Find the similar elements and compute the number of times they occur.
 - c. Rearrange in reverse order without using a second array. [8]
4. (a) Write a program to concatenate first n characters one string to another string. [4]
- (b) What is recursion? What are the advantages of recursive functions over to iterative functions? Write non-recursive and recursive programs to find the GCD of two numbers. [8]
5. (a) How can a pointer be used to access individual element of an array? Illustrate with an example. [4]
- (b) Differentiate between malloc(), calloc(), and realloc() functions. What is the purpose of the realloc() function. Write a program to demonstrate the working of realloc() function. [8]
6. (a) Declare a structure(s) that represents the following information of a student: [4].
 - a. Roll_no
 - b. Name
 - i. First name
 - ii. Second name
 - iii. Last name
 - c. Sex
 - d. Date of Birth
 - i. Date
 - ii. Month
 - iii. Year

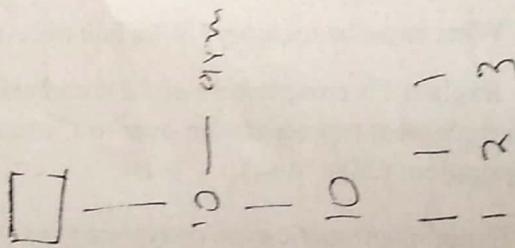
(b) Write a program to read, display, add and subtract two complex numbers using user defined functions. [8]

7. Write short notes on (any four):

- (a) Identifier and keyword
- (b) Switch case
- (c) Null pointer
- (d) Pointer to structure
- (e) Static storage class

[10]

550 545 - 5
10 10 10 10 10



$$\frac{a + b}{r.d + i.d}, \quad a, b$$

$R[i] = R[N-i]$

OS 03-2015
16-10-1996

str. —
{
 d1
 m1

$$a = C^{d_1}_{d_2} m_1 G_1 + C^{d_2}_{d_1} m_2 G_2$$

12-

Department of Computer Science and Engineering
National Institute of Technology Patna
End Semester Examination – Odd Sem, July-Dec 2016
A1/A2/A3/B.Arch 1st Sem

Subject: Introduction to Computing
Code: 1CS101

F.M:70
Time: 3hrs

Answer ALL questions. There are two pages in this question paper.

- Q1. ~~(a)~~ WAP in C to swap two numbers without using third variable. [5 marks]
~~(b)~~ WAP in C to check a string is palindrome or not. [5 marks]
- Q2. ~~(a)~~ WAP in C to reverse of an inputted number. [5 marks]
~~(b)~~ WAP in C to addition, multiplication, division and subtraction using switch case. [5 marks]
- Q3. ~~(a)~~ WAP in C to convert Fahrenheit to Celsius. [5 marks]
~~(b)~~ WAP in C to add two matrices. ↘ 3, 3
- Q4. ~~(a)~~ WAC Write a program in C to accept 50 numbers from user (through keyboard) and find the greatest number not greater than 100. [5 marks]
(b) Write a program in C to obtain value of $\sin(x)$ up to 50th term: [5 marks]
- $$\sin(x) = x - x^3/3! + x^5/5! - x^7/7! + x^9/9! - \dots$$

Page 2 of this exam would be arriving in half an hour.

$$U_n = \frac{x^{2n-1}}{(2n-1)!}$$
$$\text{sum} = \text{sum} + (\text{pow}(x, n) * \text{pow}(x, 2n-1)) / (2n-1)$$

National Institute of Technology Patna

Ashok Rajpath, Patna

End Semester Examination May'14

Course Code : 2CS101

GR_B

Time allowed : 03:00 Hours

L-T-P : 2-1-0

Subject : Introduction to Computing

Full Marks : 60

Pass Marks: 33

Answer any five questions. Assume missing data if any. Provide sufficient comment to your programming code.

Q1. [3+7]

- Write an Algorithm to count total numbers of different characters in a text file.
- Write a C program to implement the Algorithm written for part 'a' of this question. (Assume the file name as test.txt)

Q2. [5+5]

- You have to implement a simple student database where each of the student record have attributes – Name, Roll-Number and Mobile-Number. Write a C program to implement same where these records will be saved in a file.
- What is String in C programming language? Consider the following two methods of String declaration:
 - char a[10] = "NIT PATNA"
 - char *a = "NIT PATNA"

Discuss in detail about above two approaches of string usage mentioning benefit and drawback for both approaches.

Q3. [2+8]

- What are pointers variable in C programming language? Illustrate declaration, initialization, access and assignment of pointer variables with the help of an example for each. How pointer variables are different from non-pointer variables? Discuss benefit of using pointer variable.
- Write a C program to implement following:
 - Input two matrix of size 2x3 and 3x2 from users
 - Calculate transpose of both matrix
 - Calculate multiplication matrix of transposed matrix
 - Calculate transpose of result matrix and print on console in matrix format.

Q4. [4+6]

- What is Structure data type in C? What is benefit of structure data type? Demonstrate declaration, initialization and accessing members of structure data type with suitable example.

ENGLISH

Teacher's Signature

National Institute of Technology Patna
Ashok Rajpath, Patna-800 005

Mid-Semester Examination October 2014 (B. Tech. & B. Arch.)

Course Name: English Literature

Course Code: IHS101

Groups: A1, A2, A3 & Arch.

Full Marks: 20

Time: 2 Hours

NB: Answer any four questions.

Q. 1. Discuss the images of Aneas/Anchises and the Colossus that Cassius applies to Julius Caesar as a part of his strategy.

Q. 2. What is a vertically structured society? Explain it with reference to Marullus and Flavius versus the Cobbler, Carpenter and the Vulgar. You may also apply the theory of *homo hierarchicus* that has been propounded by Louis Dumont.

Q. 3. Explain the life of Shakespeare.

Q. 4. What kind of leader is Julius Caesar? The conspirators say he's a tyrant headed for absolute power. Is there evidence in the play to support this? Give reasons to support your answer.

Q. 5.
 "I come to bury Caesar, not to praise him.
 The evil that men do lives after them;
 The good is oft interred with their bones;
 So let it be with Caesar."

Q. 6. Explain any two themes in the play Julius Caesar with special reference to the enmity or friendship between Brutus, Caesar and Cassius.

Q. 7. Explain the role of Shakespeare as a dramatist.

Mid-Semester Examination September 2017

Course Name: English Literature
Groups: A1, A2, A3 & BArch
Time: 2 Hours

Course Code: IHS101
Full Marks: 20

Section 1: For A1, A2 & A3 Groups

NB: Answer any four questions. All questions carry equal marks.

Q. 1. Shakespeare is considered as world's greatest dramatist. Discuss. [5 Marks]

Q. 2. Explain any two themes in the play *Julius Caesar* with special reference to the enmity or friendship between Brutus, Caesar and Cassius. [5 Marks]

Q. 3. The play is entitled *Julius Caesar* even though Caesar is dead by Act III. Do you think this is an appropriate title? If not, choose a more appropriate title. Defend your answer. [5 Marks]

Q. 4. Compare and contrast the characters of Brutus and Cassius. [5 Marks]

Q. 5. "Beware the ides of March."

Or

"This was the most unkindest cut of all;
For when the noble Caesar saw him stab,
Ingratitude, more strong than traitor's arms,
Quite vanquished him." [5 Marks]

Q. 6. Discuss the dramatic significance of the opening scene of the play *Julius Caesar*. [5 Marks]

Q. 7. Discuss the three unities of drama. [5 Marks]

Section 2: For BArch Batch

NB: Attempt all questions.

Q. 1. Critically analyze the Festival of Lupercal in the play *Julius Caesar*. [10 Marks]

Q. 2. How do you view the vertically-structured societies? Apply different ideas discussed in the class. [10 Marks]

Mid-Semester Examination March 2016 (B. Tech.)

Course Name: English Literature
Groups: B1, B2, B3 & M.Sc.

Course Code: 2HS101
Full Marks: 20
Time: 2 hours

Instruction: Section I is to be attempted by the students of B1 and B2 while Section II is for B3& M.Sc. students.

Attempt your respective section only.

Section- I (For B1 and B2 Groups)

Answer any four questions. All questions carry equal marks.

1. What do you know about the life of William Shakespeare? Include the influences that impacted his writing as a playwright. (5 marks)
2. Write a brief note on the dramatic techniques used by William Shakespeare in the play Julius Caesar. (5 marks)
3. Who is the protagonist in this play? Is it Caesar, who dies well before the end but whose power and name continue on? Or is it Brutus, the noble man who falls because of his tragic flaws? (5 marks)
4. Explain any one of the following:

For Antony is but a limb of Caesar.

Let us be sacrificers but not butchers, Caius.

We all stand up against the spirit of Caesar,

Or

Thy honorable mettle may be wrought

From that it is disposed. Therefore it is meet

That noble minds keep ever with their likes,

For who so firm that cannot be seduced?

(5 marks)

5. Write a critical summary of Act II in the play Julius Caesar. (5 marks)
6. Discuss Shakespeare's use of super natural in his tragedies with special reference to 'Julius Caesar'. (5 Marks)

Mid-Semester Examination March 2016 (B. Tech.)

SECTION 2

TO BE ATTEMPTED BY ONLY M.Sc. [PHY, CHEM, MATHS] & B3 [IT]

Course Name: English Literature

Course Code: 2HS101

Groups: M.Sc & B3

Full Marks: 20

Time: 2 Hours

NB: Incorporation of class discussion is compulsory.

Q. 1. Critically analyse the marital dyads of Calpurnia-Caesar and Portia-Brutus. The gender dimension may be utilised in the analysis. [10 Marks]

Or

*What are the characteristics of the Cobbler-Carpenter and the citizens of Rome?
Discuss with reference to the idea of vertically-structured societies.*

Q. 2. Cassius (in conversation with Brutus):

“Age, thou art sham’d!/Rome, thou hast lost the breed of noble bloods!”
Explain this in the light of the rhetoric of nation-building. [10 Marks]

Or

*Discuss the forebodings enunciated by means of the Soothsayer, Calpurnia's dream,
and Artemidorus' letter.*

Mid-Semester Examination March 2014 (B. Tech. & B. Arch.)

Course Name: English Literature

Course Code: 2HS101

Groups: B1, B2, B3

Full Marks: 20

Time: 2 Hours

NB: Answer any four questions.

Q. 1. Give a critical appreciation of Act II in the play Julius Caesar.

Q. 2. Explain the following:

"Well, Brutus, thou art noble; yet, I see,
Thy honourable metal may be wrought
From that it is disposed: therefore it is meet
That noble minds keep ever with their likes;
For who so firm that cannot be seduced?
Caesar doth bear me hard; but he loves Brutus:
If I were Brutus now and he were Cassius,
He should not humour me."

Q. 3. Discuss the theme of power and rhetoric in the play Julius Caesar. Consider Caesar and Brutus, Caesar and Antony, Brutus and Cassius or any other pairings. Are these true friendships or merely political alliances forged for the sake of convenience and self-preservation? Give reasons to support your answer.

Q. 4. Briefly write about importance given by William Shakespeare to female characters on the basis of Dramatis Personae.

Q. 5. Julius Caesar overlooks the soothsayer by calling him a visionary. What do you mean by the term visionary in this context?

Q. 6. Why are Marullus and Flavius upset? Discuss their condescending attitude towards the carpenter and the cobbler in terms of class struggle.

Mid-Semester Examination March 2015 (B. Tech.)

Course Name: English Literature

Course Code: 2HS101

Groups: B1, B2 & B3

Full Marks: 20

Time: 2 Hours

NB: Answer any four questions

- Q. 1. Write a brief summary on the life and works of William Shakespeare with special reference to the play Julius Caesar. (05 marks)
- Q. 2. Write a short note on the dramatic significance of storm in the play Julius Caesar. (05 marks)
- Q. 3 Explain any two themes in the play Julius Caesar with special reference to the enmity or friendship between Brutus, Caesar and Cassius. (05 marks)
- Q. 4. Explain the following: (05 marks)
“Cowards die many times before their deaths;
The valiant never taste of death but once.”
- Q. 5 (a). Is Caesar a weak ruler? Defend your answer with suitable references from the play Julius Caesar. (05 marks)
- or
- Q. 5 (b). Give a character sketch of Brutus. (05 marks)
- Q. 6. What is cobbler's language game? Explain. (05 marks)

National Institute of Technology Patna
Ashok Rajpath, Patna-800 005

End-Semester Examination October 2016 (B. Tech. & B. Arch)

Course Name: English Literature
Groups: A1, A2, A3 and B.Arch.

Course Code: 2HS101
Full Marks: 20
Time: 2 hours

Instruction: Section I is to be attempted by the students of A1 and A2 while Section II is for A3 and B. Arch. students.

Attempt your respective section only.

Section- I (For A1 and A2 Groups)

NB: Answer any four questions. All questions carry equal marks.

1. Explain the life of Shakespeare and his work as a dramatist. (5 marks)
2. Consider Brutus's actions. Is he right to join the conspiracy against Caesar? What are his reasons? Does he choose to join the conspiracy, or is he tricked by Cassius? (5 marks)
3. Discuss friendship in the play. Consider Caesar and Brutus, Caesar and Antony, and Brutus and Cassius. Are these true friendships or merely political alliances forged for the sake of convenience and self-preservation? (5 marks)
4. "Beware the Ides of March." (5 marks)

Or

"And therefore think him as a serpent's egg,
Which, hatch'd, would, as his kind, grow mischievous,
And kill him in the shell."

5. Give critical appreciation of Act I in the play Julius Caesar. (5 marks)
6. Who is the protagonist in this play? Is it Caesar, who dies well before the end but whose power and name continue on? Or is it Brutus, the noble man who falls because of his tragic flaws? (5 marks)

End-Semester Examination December 2016 (B. Tech.)

Course Name: English Literature

Course Code: 1HS101

Groups: A1, A2

Full Marks: 70

Time: 3 Hours

NB: Answer any six questions. (Question number 1 is compulsory)

- Q.1. Write short notes on the following: (20 marks)
(i) Portia and Calpurnia
(ii) "Et tu, Brute? Then fall, Caesar!"
- Q.2. Bring out the dramatic significance of the last Act of the play "Julius Caesar". (10 marks)
- Q.3. Comment on Shakespeare's conception of tragedy with special reference to the play "Julius Caesar". (10 marks)
- Q.4. Enumerate Shakespeare's use of omens, portents and superstitions in drama. Comment on whether they are to be distinguished from the supernatural in the play "Julius Caesar". (10 marks)
- Q.5. Discuss in your own words the speeches of Brutus and Antony. Comment on the relative significance of both. (10 marks)
- Q.6. Comment on any two themes of the play "Julius Caesar". (10 marks)
- Q.7. Discuss the appropriateness of the title of the play "Julius Caesar". (10 marks)
- Q.8. Explain the following: (10 marks)

"This was the noblest Roman of them all.
All the conspirators save only he
Did that they did in envy of great Caesar.
He only in a general honest thought
And common good to all, made one of them.
His life was gentle, and the elements
So mixed in him that Nature might stand up
And say to all the world, "This was a man."

Or

"That I did love thee, Caesar, O, 'tis true!
If then thy spirit look upon us now,
Shall it not grieve thee dearer than thy death
To see thy Antony making his peace,
Shaking the bloody fingers of thy foes,
Most noble, in the presence of thy corse?"

End-Semester Examination May 2016 (B. Tech. & M.Sc.)

Course Name: English Literature
Groups: B1, B2, B3 and M.Sc.

Course Code: 2HS101
Full Marks: 70
Time: 3 hours

Instruction: Section I is to be attempted by the students of B1 and B2 while Section II is for B3 and M.Sc. students.

Attempt your respective section only.

Section- I (For B1 and B2 Groups)

NB: Answer any six questions. (Question number 1 is compulsory)

- Q. 1. Write short notes on the following: (20 marks)
(i) Portia
(ii) Antony's speech
- Q. 2. Do you believe that William Shakespeare was a great playwright? Defend your answer. (10 marks)
- Q. 3. Was it possible to avoid the tragedy of Julius Caesar if the women had been heeded? Briefly write about importance given by William Shakespeare to female characters with special reference to the Dramatis Personae. (10 marks)
- Q. 4. Brutus calls Antony "a limb of Caesar" and therefore he does not accept the suggestion of Cassius to kill him. In the light of such perception, critically examine Antony's role in the play. (10 marks)
- Q. 5. Consider Brutus's actions. Is he right to join the conspiracy against Caesar? Does he choose to join the conspiracy, or is he tricked by Cassius? (10 marks)
- Q. 6. The play is entitled Julius Caesar even though Caesar is dead by Act III. Do you think this is an appropriate title? If not, choose a more appropriate title. Defend your answer. (10 marks)
- Q. 7. Explain the following:
"This was the most unkindest cut of all;
For when the noble Caesar saw him stab,
Ingratitude, more strong than traitor's arms,
Quite vanquished him."
Or
"And therefore think him as a serpent's egg,
Which, hatch'd, would, as his kind, grow mischievous,
And kill him in the shell."
- Q. 8. Explain any two themes in the play Julius Caesar with special reference to the enmity or friendship between Brutus, Caesar and Cassius. (10 marks)

End-Semester Examination May 2014 (B. Tech. & B. Arch.)

Course Name: English Literature

Course Code: 2HS101

Groups: B1, B2, B3

Full Marks: 60

Time: 3 Hours

five
NB: Answer any six questions. (Question number 1 is compulsory)

Q. 1.

Write short notes on the following: (20 marks)

- (i) Antony's speech
(ii) Artemidorus's plan

Q. 2. Was it possible to avoid the tragedy of Julius Caesar if the women had been heeded? Why is what some might call "woman's intuition" dismissed in the play as cowardice and foolishness? (10 marks)

Q. 3. Discuss the parts in which Shakespeare constructs his play Julius Caesar as a tragedy. (10 marks)

Q. 4.

Explain the following: (10 marks)

" This was the most unkindest cut of all;
For when the noble Caesar saw him stab,
Ingratitude, more strong than traitors' arms,
Quite vanquished him:"

Q. 5.

Mark Antony is shown to be a politically dormant person throughout the play Julius Caesar, yet he turns out to be victorious at the end. Is it possible to attach a political dimension to his person? If Antony is seen in political terms, then what could be his politics? Or should one believe in an argument that one becomes politically active once he or she is affected by it? (10 marks)

Q. 6.

Critically discuss the absence or presence of the masses in the play Julius Caesar.

(10 marks)

Q. 7.

Discuss what might be called small pockets or spaces that William Shakespeare creates for the marginal characters such as Portia, the Cobbler, Calpurnia, and the Carpenter. (10 marks)

Q. 8.

Soothsayer's prediction about the ides of March turns out to be true as Julius Caesar is killed in the play on this day. Should this element of the play be understood in terms of a belief in supernatural phenomena and dependence on (now less relied on) branch of knowledge called astrology? (10 marks)

End-Semester Examination May 2016 (B. Tech. & M.Sc.)
Section-II

TO BE ATTEMPTED BY ONLY MSC [PHY, CHEM, MATHS] & B3 [IT]

NB: Incorporation of class discussion is compulsory. Examples from your own contemporary world are allowed to be used in the answers.

Q. 1. Write about the following in brief:

- (i) Cobbler [5 Marks]
- (ii) Portia [5 Marks]
- (iii) Antony [5 Marks]
- (iv) Calpurnia [5 Marks]

Q. 2. What is Julius Caesar's will about? What is your opinion on its authenticity?
[10 Marks]

Q. 3. Apply a theory of ethics/power to critically analyse the killing of Julius Caesar.
[10 Marks]

Or

How do you think that Calpurnia's emotions had the potential to save Julius Caesar's life?

Q. 4. Dialogues between Portia and Brutus:

"Brutus: Kneel not, gentle Portia."

"Portia: I should not need, if you were gentle Brutus./Within the bonds of marriage, tell me, Brutus,/Is it excepted I should know no secrets/That appertain to you? Am I.../To keep with you at meals, comfort your bed,/And talk to you sometimes?.../If it be no more,/Portia is Brutus' harlot, not his wife."

Based on your understanding of the dialogues, answer the following briefly:

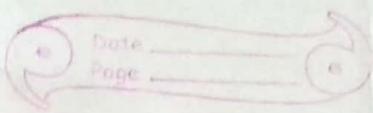
- (i) What sort of gentleness has been referred to? [5 Marks]
- (ii) What are the bonds of marriage in the play *Julius Caesar*? [5 Marks]
- (iii) What are the traditional duties of a wife that Portia speaks of? [5 Marks]
- (iv) What would you suggest Brutus in this situation? [5 Marks]

Q. 5. What is the use of the term *love* in the play *Julius Caesar*?

[10 Marks]

Or

Discuss vertically-structured society in the play *Julius Caesar*.



PHYSICS
Engineering Physics 1 PH 101

National Institute of Technology Patna

Mid Semester Examination September 2017

Time allotted: 02 Hours

Subject: Engineering Physics

Full Marks: 20

Subject code: PH101

The figures in the margin indicates full marks

Answer any 4 questions. All question carry equal marks.

1. The electric field vector of a plane electromagnetic wave in a medium is given in SI units as $\vec{E} = 5 \cos(0.002x + 560000t) \hat{z}$. Find the following properties of the medium

- (a) The velocity and direction of wave propagation
- (b) Refractive Index of the medium
- (c) Impedance of the medium
- (d) The magnetic field vector B

$$5 \cos(kx + \omega t) \hat{z}$$

$\frac{\omega}{k}$ $\frac{C}{V}$

[2+1+1+1]

2. Explain the Correction introduced by Maxwell in Ampere circuited law for the time varying field. Show that the vector fields E and B follow wave equation. Discuss the importance of the Maxwell's correction. [3+1+1]

3. a) Show that $D = \epsilon_0 E + P$, where the symbols have their usual meaning.
 b) Describe electrostatic boundary conditions for displacement vector (D) across two dielectric media
 c) Derive work-energy relation for electrodynamics [2+1+2]

4. For two sinusoidal waves, derive the resultant intensity of interference. Show when maxima, minima and no interference occur. Prove that why an extended source cannot produce interference effect. Establish a relation between line width and coherence time. [1+2+1+1]

5. Derive the intensity formula for single slit Fraunhofer diffraction pattern. Plot the intensity distribution and derive the conditions of maxima and minima. Calculate the diffraction angle corresponding to the first two minima for a plane wave with wavelength ($\lambda = 5 \times 10^{-5}$ cm) falls on a narrow slit of width 2×10^{-5} cm. [2.5+1.5+1]

6. Let at a given point two plane polarized light waves travelling in the same direction are given by $Y_1 = a \cos(\omega t - \delta) \hat{x}$ and $Y_2 = a \cos(\omega t + \delta) \hat{y}$. Obtain conditions on the parameters a , b and θ , to obtain (i) Right elliptically polarized (ii) Left circularly polarized and (iii) Linearly polarized waves.

If a right circularly polarized wave pass through a QWP and then to a HWP, what will be state of polarization of the emergent wave? [4+1]

7. State and explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray. Explain the phenomenon of double refraction. [1+2+2]

$$\sin i = \mu \sin r$$

National Institute of Technology Patna

Mid Semester Examination October 2015

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics

Subject code: PH101

The figures in the margin indicates full marks

Answer any 4 questions.

1. (A) Explain the meaning of the terms (a) Coherence time and (b) Linewidth. (2)
x (B) A Helium-Neon Laser source produces a laser beam of wavelength 632.8 nm and its coherence time is 50 ns. Calculate its coherence length and $\Delta\lambda/\lambda$. (3)
2. (A) Draw a neat working diagram of the Michelson Interferometer. (2)
x (B) In a single slit Fraunhofer diffraction experiment, the slit of width 100 μm is illuminated by a monochromatic light of wavelength 600 nm and the screen is placed at a distance of 1m from the slit. Calculate the width of the central maximum in metres. If the slit width b can be changed find the value of b in the above experiment for which the width of central maximum is the same as b . (3)
3. (A) Explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray. (2)
x (B) Draw a neat diagram and explain polarization by reflection. i.e making use of Brewster's law. (3)
- x 4. (A) Derive the equations for time dilation and length contraction. (3)
x (B) A particle of rest mass m is moving with a velocity $0.6 c$ in the x direction in a frame S. Calculate the relativistic mass and velocity of the same particle with respect to another frame S' moving with a velocity $0.5 c$ in the positive x direction with respect to the frame S. (2)
5. (A) Derive the relation between \mathbf{D} , \mathbf{E} and \mathbf{P} vectors for a dielectric. (3)
x (B) For a linear dielectric with a dielectric constant ϵ and susceptibility χ find the relation between bound charge density and free charge density. (2)
6. (A) Derive the boundary conditions for normal and tangential components of the electric field vector \mathbf{E} at the interface of two dielectric media with permittivity ϵ_1 and ϵ_2 respectively. (4)
x (B) State the difference between dielectrics and conductors. (1)
7. Derive the work-energy theorem for electromagnetic fields. Explain the theorem with the significance of each term in it. (5)

National Institute of Technology Patna

Mid Semester Examination September 2016

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics

Subject code: PH101

The figures in the margin indicates full marks

Answer any 4 questions. All question carry equal marks.

1. In a non-magnetic medium electric field vector is given by $\vec{E} = 4 \sin(2\pi \times 10^7 t - 0.8x) \hat{k}$ volt/m. Find the following quantities; (a) The direction of wave propagation (b) The dielectric susceptibility (χ_e) of the medium (c) The Magnetic field vector (d) The time average power carried by the wave across per unit area. [1+2+1+1]
2. Show how Maxwell corrected the error in Ampere Circuited law for time varying fields and also show that electromagnetic wave vector field E and B follow wave euqation. Elaborately explain the significance of the above correction. [2+2+1]
3. What are conditions of interference effect? For two sinusoidal waves, derive the resultant intensity of interference. Show when maxima, minima and no interference occur. Prove that why an extended source cannot produce interference effect. [1+2+1+1]
4. Derive the intensity formula for single slit Fraunhofer diffraction pattern. Plot the intensity distribution and derive the conditions of maxima and minima. Calculate the diffraction angle corresponding to the first two minima for a plane wave with wavelength ($\lambda = 5 \times 10^{-6}$ cm) falls on a narrow slit of width 2×10^{-3} cm. [2.5+1.5+1]
5. Let at a given point two plane polarized light waves travelling in the same direction are given by $Y_1 = a \cos(\omega t) \hat{x}$ and $Y_2 = a \cos(\omega t + \delta) \hat{y}$. Obtain conditions on the parameters a , b and θ , to obtain (i) Right elliptically polarized (ii) Left circularly polarized and (iii) Linearly polarized waves.
- If a circularly polarized wave pass through a HWP and then to a QWP, what will be state of polarization of the emergent wave? [4+1]
6. State and explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray. Explain the phenomenon of double refraction. [1+2+2]
7. Describe the working of Michelson Interferometer with a neat diagram. How it can be used to find out coherence length of a source and to determine the separation between two wavelengths? [3+1+1]

National Institute of Technology Patna

Mid Semester Examination October 2015

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics

Subject code: PH101

The figures in the margin indicates full marks

Answer any 4 questions.

1. (A) Explain the meaning of the terms (a) Coherence time and (b) Linewidth. (2)
(B) A Helium-Neon Laser source produces a laser beam of wavelength 632.8 nm and its coherence time is 50 ns. Calculate its coherence length and $\Delta\lambda/\lambda$. (3)
2. (A) Draw a neat working diagram of the Michelson Interferometer. (2)
(B) In a single slit Fraunhofer diffraction experiment, the slit of width 100 μm is illuminated by a monochromatic light of wavelength 600 nm and the screen is placed at a distance of 1 m from the slit. Calculate the width of the central maximum in metres. If the slit width b can be changed find the value of b in the above experiment for which the width of central maximum is the same as b . (3)
- 3: (A) Explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray. (2)
(B) Draw a neat diagram and explain polarization by reflection, i.e making use of Brewster's law. (3)
4. (A) Derive the equations for time dilation and length contraction. (3)
(B) A particle of rest mass m is moving with a velocity $0.6 c$ in the x direction in a frame S. Calculate the relativistic mass and velocity of the same particle with respect to another frame S' moving with a velocity $0.5 c$ in the positive x direction with respect to the frame S. (2)
- 5.(A) Derive the relation between \mathbf{D} , \mathbf{E} and \mathbf{P} vectors for a dielectric. (3)
(B) For a linear dielectric with a dielectric constant ϵ and susceptibility χ find the relation between bound charge and free charge density. (2)
6. (A) Derive the boundary conditions for normal and tangential components of the electric field vector \mathbf{E} at the interface of two dielectric media with permittivity ϵ_1 and ϵ_2 respectively. (4)
(B) State the difference between dielectrics and conductors. (1)
7. Derive the work-energy theorem for electromagnetic fields. Explain the theorem with the significance of each term in it. (5)

$\frac{dQ}{dt}$

National Institute of Technology Patna

Mid Semester Examination October 2015

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics

Subject code: PH101

The figures in the margin indicates full marks

Answer any 4 questions.

1. (A) Explain the meaning of the terms (a) Coherence time and (b) Linewidth. (2)
(B) A Helium-Neon Laser source produces a laser beam of wavelength 632.8 nm and its coherence time is 50 ns. Calculate its coherence length and $\Delta\lambda/\lambda$. (3)
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3. (A) Explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray. (2)
(B) Draw a neat diagram and explain polarization by reflection, i.e making use of Brewster's law. (3)
4. (A) Derive the equations for time dilation and length contraction. (3)
(B) A particle of rest mass m is moving with a velocity $0.6 c$ in the x direction in a frame S . Calculate the relativistic mass and velocity of the same particle with respect to another frame S' moving with a velocity $0.5 c$ in the positive x direction with respect to the frame S . (2)
5. (A) Derive the relation between \mathbf{D} , \mathbf{E} and \mathbf{P} vectors for a dielectric. (3)
(B) For a linear dielectric with a dielectric constant ϵ and susceptibility χ find the relation between bound charge and free charge density. (2)
6. (A) Derive the boundary conditions for normal and tangential components of the electric field vector \mathbf{E} at the interface of two dielectric media with permittivity ϵ_1 and ϵ_2 respectively. (4)
(B) State the difference between dielectrics and conductors. (1)
7. Derive the work-energy theorem for electromagnetic fields. Explain the theorem with the significance of each term in it. (5)

National Institute of Technology

Mid Semester Examination, March 2014

Subject-Physics, Course code: 2PH1C1

Full Marks:- 20

Time: - 2 Hours

Answer any four questions in your own words as far as practicable. Questions are of equal values.

1. (a) Define electric polarisation in dielectrics.

(b) Why external electric field becomes zero in electrostatic equilibrium in conductors? What happens to electric field in dielectrics?

(c) Give one example with proof where contribution to electric field due to polarisation charges are taken into account along with field due to free charges.

2. What is black body radiation? Describe the basic postulates made by Planck in order to explain black body's radiation curve.

An electron subjected to 54V potential difference, obtain its momentum.

3. What is polarisation of light? Describe analysis of circularly and elliptically polarised light?

Calculate the thickness of the quarter wave plate for the light of 5893 Å, Refractive indices of O-ray and e-ray are 1.57 and 1.526 respectively.

4. (a) Show that acceleration transformation is invariant under Galilean transformation.

(b) Show that Galilean transformation equation does not hold in the case of electro magnetism.

(c) What are the significance of negative result of Michelson-Morley experiment?

5. (a) Derive inverse Lorentz transformation equation.

(b) Show that if (x, y, z, t) and (x', y', z', t') be the coordinates of one event in S frame and the corresponding event in S' frame respectively, then the expression $ds^2 = dx^2 + dy^2 + dz^2 - c^2 dt^2$ is invariant under Lorentz transformation of coordinates.

National Institute of Technology Patna

Mid Semester Examination March 2016

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics

Subject code: PH101

The figures in the margin indicates full marks

Answer any two questions from each group

Group-A

1. Derive the electrostatic boundary conditions for electric field at the interface of two dielectric media. Do not assume that the dielectrics are linear. [5]
2. Derive the expression of displacement current. Show that the conduction current in the leads of a capacitor is equal to the displacement current between its plates. [3+2]
3. The Electric field in a region is given in SI units as $E = 2y^2x\hat{i} + 2z^2y\hat{j} + 2x^2z\hat{k}$ Assuming $\epsilon_0 = 1$ find the total charge inside a spherical volume of radius R centred at the origin. Starting with Maxwell's equations in free space, prove that light is an electromagnetic wave. [3+2]

Group-B

1. What is coherence? Show that an extended source cannot produce interference effect. Derive a relation between line width and coherence time and explain the result. [1+1+3]
2. For two sinusoidal waves derive the resultant intensity of interference. Show when maxima, minima and no interference occur. Define the fringe visibility and explain. [2+2+1]
3. Derive the intensity distribution formula for single slit Fraunhofer diffraction pattern. Show the conditions of maxima and minima. Calculate the diffraction angle corresponding to the first two minima for a plane wave with wavelength ($\lambda = 5 \times 10^{-6}$ cm) falls on a narrow slit of width 2×10^{-3} cm. [2.5+1.5+1]

-----Best of luck-----

National Institute of Technology Patna

Mid Semester Examination October 2014

Time allotted: 02 Hours

Full Marks: 20

Subject: Engineering Physics- I

Subject code: 1PH101

For Section A-1

The figures in the margin indicate full marks

Answer any *three* from questions

For Section A-2

The figures in the margin indicates full marks (0.5 marks for clarity and fairness)

Answer any three questions

1. a) What is blackbody radiation? Derive the Rayleigh's energy distribution and explain it.
What is ultraviolet catastrophe? [1+3+1]

b) When two light beams of wavelengths $\lambda_1 = 52 \text{ nm}$ and $\lambda_2 = 120 \text{ nm}$ fall on a metal surface, they produce photoelectrons with energies 115 eV and 254 eV respectively. Estimate the numerical value of the Planck constant. [1.5]

✓ What is work function in photoelectric effect? Describe the Compton effect and importance of it. Derive the formula of Compton shift of wavelength. Calculate Compton wavelength of electron. [1+1.5+3+1]

✓ a) Derive the intensity formula for double slit Fraunhofer diffraction pattern. Show the conditions of maxima and minima. [5]

✓ b) A linearly polarized light of horizontal orientation on a linear polarizer oriented at +45 degree. What will be the emergent ray if the light enters a polariser whose transmission axis is vertical? [1.5]

4. a) Starting from wave equation how to explain linear, circular and elliptical polarization of light in Jones matrix method. How do you explain right and left circularly polarized light? [3.5+1]

- b) A plane wave with wavelength ($\lambda = 5 \times 10^{-6}$ cm) falls on a narrow slit of width 2×10^{-3} cm. Calculate the diffraction angle corresponding to the first two minima. [2]

- ✓ 5. Consider a frame O is moving along x-axis relative to the frame O' with velocity v . Derive length contraction and time dilation formula using geometrical representation. If a rod is to appear shrunk by half along its direction of motion, at what speed should it travel? [5+1.5]

For Section A-3

The figures in the margin indicates full marks

Answer any three questions

1. Set the constitutive equation $\vec{D} = \epsilon \vec{E}$ and explain on the basis of above
 - i) Linear Dielectrics
 - ii) Non-linear Dielectrics[3+3]
2. Explain the continuity of \vec{D} and \vec{E} across the boundary of two dielectrics having no charge density. Compare it with propagation of light in two transparent media. [7]
3. Write Maxwell's equation in integral and differential form and its special cases in air or vacuum. [7]
4. a) Establish the local conservation of charge and the conditions in which this is applied.
b) What do you mean by displacement current? Find an expression of it. [3+3]
5. What is Poynting vector? Explain the vector in terms of direction of propagation and its magnitude at any instant of time. [6]

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$1/\sqrt{2}$

National Institute of Technology Patna
End Semester Examination, December 2015

Time Allotted: 03 hours

Full Marks: 70

Subject: Engineering Physics

Subject Code: PH101

The figures in the margins indicate full marks

Attempt all the questions. Clearly indicate the sub-question before each answer.

Q1. Answer all the questions *briefly* (max 2 lines) and *to the point*

- a. In a double slit interference experiment using a Neon lamp ($\tau_e = 10^{-9}$ s) why do we see only the first few fringes clearly?
- b. What is the importance of Davison-Germer experiment?
- c. Why is population inversion essential to laser action?
- d. Write down the equation for electric charge conservation.
- e. What is the significance of the Maxwell's equation $\nabla \cdot \mathbf{B} = 0$
- f. What is the Heisenberg's principle of uncertainty in quantum mechanics? Is it valid when the position and momentum of a particle are measured at two different times?

(2×6)

Q2. Write *short* answers to any **four** of the following.

- a. Describe stimulated emission and discuss its importance to laser action
- b. Derive Planck's black body radiation formula and discuss its significance
- c. State de Broglie's concept of matter waves associated with a particle and explain the meaning of group and phase velocity of matter waves.
- d. State the two principles of Einstein's theory of special relativity. State the main difference between Einstein's relativity and Galilean relativity.
- e. Briefly describe, with a diagram, the phenomenon of polarization by double refraction.
- f. Discuss the significance of the displacement current term introduced by Maxwell in Ampere's law.

(5×4)

Q3. Answer any **four** of the following.

- a. Describe the Michelson-Morley experiment for the speed of light in ether. Discuss the significance of the null result of the experiment.
- b. Obtain an expression for Compton wavelength. Briefly discuss Compton's experiment for scattering of photons and state its significance.
- c. Describe single slit Fraunhofer diffraction of light and obtain an expression for the intensity distribution.
- d. Describe, with proper diagrams, the working of the He-Ne laser. Explain its advantages over the Ruby laser and state some applications.
- e. (i) Write the expression of momentum operator and show that it is Hermitian. (ii) Let a wave $|\Psi\rangle$ is written as linear superposition $|\Psi\rangle = \alpha|\psi_1\rangle + \beta|\psi_2\rangle + \gamma|\psi_3\rangle$. Find the probability of finding the state $|\psi_1\rangle$.

(6×4)

Q4. At a given point two plane polarized light waves travelling in the same direction are given by

$$\mathbf{E}_1 = a \cos(\omega t) \mathbf{i} \quad \text{and} \quad \mathbf{E}_2 = b \sin(\omega t - \theta) \mathbf{j}$$

Obtain simple conditions on the parameters a , b and θ so that the interference of the two waves leads to

- (1) Right elliptically polarized (2) Left circularly polarized and (3) Linearly polarized waves.

(7)

OR

At what speed does the kinetic energy of a relativistic particle equal its rest energy? What are the momentum and total energy of the particle in such a case?

(7)

Q 5. A substance consists of N atoms each of which is a two-level system with ground state rest energy E_1 and excited state rest energy E_2 . At an absolute temperature T the number $N_{1,2}$ of atoms of the substance in the state with energy $E_{1,2}$ is given by $N_{1,2} = C \exp(-E_{1,2} / k_B T)$, where C is a constant. Let $E_2 - E_1 = \Delta$

(a) Eliminate the constant C and show that the ratio $N_{2,1} / N = 1 / (1 + \exp(\pm \Delta / kT))$.

(b) It can be shown that at $T = 0$ all the atoms of the substance are in the ground state. If the rest mass of the substance at $T = 0$ and at any temperature T is given by $M_{initial}$ and M_{final} respectively, show that the ratio $(M_{final} - M_{initial}) / M_{initial}$ is given by

$$(E_2 / E_1 - 1) / (1 + \exp(\Delta / kT))$$

(7)

OR

Write down the time independent Schrodinger equation for a particle in a one dimensional box and obtain the energy levels and normalized wavefunctions corresponding to the energy. Plot first two eigenfunctions. Use the uncertainty principle to argue that $n = 0$ level is not possible.

[7]



NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
END SEMESTER EXAMINATION, 2016, SESSION: 2015-16 SPRING SEMESTER

Program: B. Tech.
Course Code: 2PH101
Full Marks: 70

Semester: 2nd

Dept: ECE/CSE/IT/Int MSc (All)
Course Name: Engineering Physics
Duration of Examination: 3 hours

ANSWER ANY FIVE QUESTIONS

- Q.1 (a) Write down the final Maxwell's equations in their integral and differential forms. [4]
(b) State Poynting's theorem. Using the 3rd and 4th equations of Maxwell, prove Poynting's theorem. [5]
(c) A long straight wire, carrying uniform line charge λ , is surrounded by rubber insulation out to a radius R. Find the electric displacement at a distance r from the wire, where $r < R$. Also calculate the electric field at a distance r_1 , where $r_1 > R$ [5]
- Q.2 (a) Considering that the intensity distribution for a single slit Fraunhofer diffraction is given by $I = I_0 \frac{\sin^2 \beta}{\beta^2}$, calculate the positions of maxima and minima. [5]
(b) Write down the Rayleigh criterion for resolution of two spectral lines. [3]
(c) To resolve the Na-doublets D_1 and D_2 in its first order diffraction with a plane transmission grating, calculate the minimum number of lines/cm required. ($\lambda_{D_1} = 589.6 \text{ nm}$, $\lambda_{D_2} = 589.0 \text{ nm}$) [6]
- Q.3 (a) Write a short note on double refraction. In this context, what do you mean by uniaxial negative crystals and uniaxial positive crystals? [3]
(b) Two polarizing sheets have polarizing directions parallel so that the intensity of the transmitted light is maximum. Through what angle must either sheet be turned if the intensity is to drop by (i) $\frac{1}{2}$ (ii) $\frac{1}{4}$ [5]
(c) A ray of light is incident on a surface of water of refractive index 1.33. If the reflected light is completely plane polarized, calculate the angle of polarization and hence angle of incidence and refraction. [6]
- Q.4 (a) Considering the example of a muon striking the surface of earth, explain time dilation and length contraction. [4]
(b) Show that $x^2 + y^2 + z^2 - c^2 t^2 = 0$, is invariant under Lorentz transformation. [5]
(c) An electron ($m_0 = 9.1 \times 10^{-31} \text{ kg}$) is moving with a velocity of $0.99c$. What is its total energy? Find the ratio of Newtonian kinetic energy to the relativistic kinetic energy. [5]
- Q.5 (a) Explain the concepts of stimulated emission, population inversion and light amplification. [3]
(b) Derive the relation between Einstein's coefficients for spontaneous and stimulated emission. [5]
(c) Explain the working of a He-Ne laser. Explain the advantages of He-Ne laser over Ruby laser. [6]
- Q.6 (a) Explain UV catastrophe. Write down the Planck's law of blackbody radiation and show that it merges with the Rayleigh Jeans law at low frequencies. [3]
(b) Derive the change in wavelength for a photon inelastically scattered by a stationary electron. Show that the maximum change in wavelength can be 4.852 pm. [5]
(c) Explain the Davisson Germer experiment and its result. Show that there is parity with respect to λ , whether calculated through Bragg's law ($d = 0.091 \text{ nm}$ and $\theta = 65^\circ$) or de Broglie's formula (Kinetic energy = 54 eV). [6]
- Q.7 (a) Explain the uncertainty principle considering both the viewpoints of matter as a wave and particle. [3]
(b) Set up the Schrödinger's equation for a free particle confined within a box of length L and solve it to obtain the normalized wavefunctions and energy eigenvalues. [5]
(c) Using the ground state wavefunction obtained in the previous question, calculate $\langle x \rangle$ and $\langle p \rangle$. Explain the physical significance of the obtained expectation values. [6]

Time allotted: 3 hrs.

SUBJECT: Engineering Physics - I

Course code: 2PH101

Attempt any five out of nine questions

1. State and explain the fundamental postulates of special theory of relativity and derive Lorentz space time transformation equations on their basis. [4+10]
2. Obtain Einstein's mass energy relation and discuss it. Give some evidence showing its validity. The mass of a moving electron is 15 times of its rest mass. Calculate its kinetic energy and momentum. [7+3.5+3.5]
3. (a) Explain the terms absorption, spontaneous emission, stimulated emission, and population inversion. [1.5x4]
 (b) Write short notes on any two of the following
 (i) Amplification of light. (ii) Optical resonator. (iii) Difference between ordinary and laser light. [4+4]
4. (a) What is meant by radiationless decay in solid state laser? Explain the construction and working of ruby laser with necessary diagrams? What is spiking in ruby laser. [1+4+5-2]
 (b) Compare He-Ne laser from ruby laser. [2]
5. (a) Discuss the blackbody radiation phenomena and its significance. Express the Planck radiation formulae in terms of wavelength. [5+1]
 (b) Discuss uncertainty principle. What is the uncertainty of Energy associated with time? A Hydrogen atom is 5.3×10^{-11} m in radius. Use uncertainty principle to estimate the minimum energy an electron can have in this atom. [3+2-3]
6. (a) What are phase and group velocities associated to a moving particle? [3]
 (b) What is the wave function of a particle trapped inside a one dimensional box with potential:

$$V(x) = \infty; x=0, x=a \quad V(x) = 0; 0 < x < a$$

 Find the probability of finding the particle between $1.2a$ and $0.6a$ for the ground and first excited states. [5+4]
 Find the value of "A" for the wave function $\psi = A x e^{-x^2/2}$. [2]
7. (a) Prove that the intensity distribution for diffraction through a single slit is given by $I = I_0 \frac{\sin^2 \beta}{\beta^2}$ where the symbols have their usual meanings. Calculate the resolving power of a grating.
 (b) Calculate the missing orders in a double slit Fraunhofer diffraction pattern, if the widths of slits are 0.08×10^{-3} m and they are 0.4×10^{-3} m apart. [10-4]
8. (a) Explain the difference between unpolarised, circularly polarized and elliptically polarized light.
 (b) Two polaroids are adjusted so as to obtain maximum intensity. Through what angle should one Polaroid be rotated to reduce the intensity to (i) half, (ii) one-fourth
 (c) Calculate the thickness of a quarter wave plate of wavelength 6100 \AA . [5+4+5]
9. (a) For a dielectric show that the polarization current density dP/dt satisfies the continuity equation for the bound charge
 (b). From Maxwell's equation in linear medium with magnetic permeability μ and electric permittivity ϵ derive the wave equation for the propagation of the electric field E .
 (c) For a monochromatic plane wave show that the total energy density is twice the energy density carried by the electric field. [4+5+5]

NATIONAL INSTITUTE OF TECHNOLOGY PATNA, PATNA

(Ashok Rajpath Patna-800 005)
End Semester Examination May-2014

Course code: 2PH101

Time allowed: 03:00 Hours

L-T-P : 3-1-0

Subject : Engineering Physics-I

Full Marks : 60

Pass Marks: 19.8

Attempt any five questions. All questions carry equal marks. Assume missing data if any.

Q. No.		Marks
1.	a) Show that the population inversion is not possible by direct excitation from a lower to higher energy level. b) Show that the ratio of Einstein A coefficient for spontaneous emission to that of Einstein B coefficient for stimulated emission is given by $8\pi h\nu^3/c^3$. c) Find the ratio of population of the two states of a laser that produces a light of wave length 6943 Å at 30° C.	[3] [6] [3]
2.	a) What is the difference between Fraunhofer and Fresnel class of Diffraction? b) Describe an expression of intensity at a point for Fraunhofer diffraction due to a double slit. Draw the intensity distribution curve, point out the maxima and minima and explain it. c) Can X-ray produce diffraction of light? Justify.	[2] [3+3+2] [2]
3.	a) Explain the phenomenon of Lorentz - Fitzgerald contraction. b) Prove that the massless particle can have a momentum. c) Prove that for a photon moving with velocity of light having rest mass zero.	[5] [3] [4]
4.	Interpret wave function Ψ and associated wave of a moving particle so that the group velocity of wave is particle velocity.	[4 + 8]
5.	a) Describe the basic principle on which the elliptically and circularly polarised formed. Discuss the importance of quarter wave plate in polarisation of light. b) At what angle of incidence will the light reflected from water be completely polarised? Does it depend upon the wave length of light? (Refractive index of water is 1.33)	[6+2] [2+2]
6.	a) What do you mean by linear and nonlinear dielectric? b) Establish the relation among three electric vectors \vec{D} , \vec{E} and \vec{P} . c) Prove that the surface charge density due to polarisation is $\sigma_p = \vec{P} \cdot \hat{n}$ where the symbols have their usual meaning.	[3] [6] [3]
7.	Write short notes of any <u>two</u> of the following: a) Heisenberg's uncertainty principle, b) Negative temperature condition c) Brewster's law of polarisation, d) Poynting's theorem	[6×2]

National Institute of Technology Patna
End Semester Examination, December 2016

Time Allotted: **03** hours

Full Marks: 70

Subject: Engineering Physics

Subject Code: PH101

The figures in the margins indicate full marks

Answer any 5 question

1. a) What is phase velocity and group velocity? Show that group velocity is equal to particle velocity
b) X-rays of wavelength 0.75 \AA are scattered from a target at an angle of 45° . Calculate the wavelength of scattered X-rays.
c) A quarter wave plate is to be made of quartz. The refractive indices of quartz for blue light of wavelength 434 nm are $n_0 = 1.5539$ and $n_e = 1.5634$ corresponding to the O-ray and E-ray respectively. Calculate the required thickness of the quartz.
d) Explain Brewster's law. Show that, at Brewster's angle the reflected ray is normal to the refracted ray.

[4+3+3+4]

2. a) Derive the intensity distribution of double slit Fraunhofer diffraction.

b) Provide the conditions for Maxima and Minima.

c) What are the missing orders?

b) In a double slit diffraction experiment, how many interference minima will occur between two diffraction minima on either side of the central maxima? The values of the relevant parameters are the following; slit width ($b = 8 \times 10^{-3} \text{ cm}$), distance between two slits ($d = 4 \times 10^{-2} \text{ cm}$) and wave length ($\lambda = 4 \times 10^{-5}$). [6+3+1+4]

3. a) Write down the time independent Schrodinger equation for a particle in a one dimensional box.

b) Obtain the energy levels and normalized eigen-functions corresponding to the energy.

c) Plot first two eigen-functions.

d) Derive expectation values of the position and the momentum for the eigen-functions $n=1$ and $n=2$.

[6+2+1+5]

4. a) Discuss Maxwell's correction of Ampere's law.

b) How Maxwell's equations are inconsistent without that correction?

c) What are the significance of the Maxwell's equation $\nabla \cdot \mathbf{B} = 0$ and $\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$?

d) Derive the work-energy theorem for electromagnetic fields. Explain the theorem with the significance of each term in it. [3+3+3+5]

5. a) Identify Einstein's coefficients with respect to absorption, spontaneous emission and stimulated emission of radiation? Derive relation between them.

b) Describe, with proper diagrams, the working of the He-Ne laser. Explain its advantages over the Ruby laser and state some applications [8+6]

6. a) Describe the Michelson-Morley experiment for the speed of light in ether. Discuss the significance of the null result of the experiment.

b) In an inertial frame of reference S, an observer finds two events occurring at the same time at coordinates $x_1 = 0$ and $x_2 = d$. A differential frame S' moves with velocity v with respect to S along the positive x-axis. An observer in S' also noticed these two events occur at time t'_1 and t'_2 at position x'_1 and x'_2 . Find dt' and dx' where $dt' = t'_2 - t'_1$ and $dx' = x'_2 - x'_1$. [7+7]

7. a) Derive the Lorentz transformation equations and obtain the Galilean transformation relation in low velocity limit. Derive energy, momentum relation in relativity.

b) What is the Heisenberg's principle of uncertainty in quantum mechanics? Derive energy-time uncertainty relation from position-momentum uncertainty relation.

b) Prove that momentum operator is Hermitian

c) Derive the relation between \mathbf{D} , \mathbf{E} and \mathbf{P} vectors for a dielectric.

[5+2+2+5]

ELECTRICAL

ELEMENTS OF ELECTRICAL ENGINEERING, ZEE101

END SEMESTER EXAMINATION OF MAY 2016

TIME - 3 hrs

F M-70

Answer any five questions

1(a) What do you mean by active and passive network.

State and explain Kirchhoff's Laws with examples. - 4

1(b) Determine capacitor current i_c in the fig-1, if $v_1 = 10 \sin st$, $i_2 = 4 \sin st$, $i_3 = 5 \cos st$ and $i_5 = 2 \sin 5t - 3 \cos 5t$.

1(c) Find the voltage V_1 by using mesh analysis in Fig-2 ~ 1

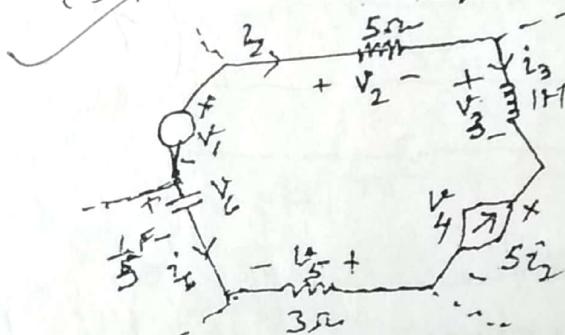


Fig-1

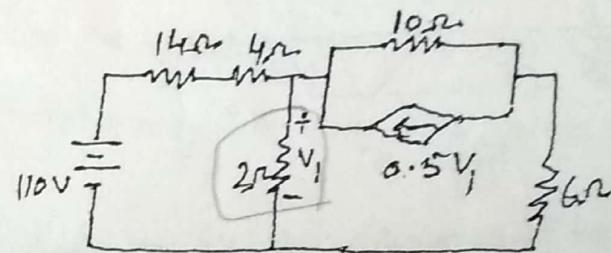


Fig-2

2(a) Use nodal analysis method, to find current in the A-B branch of the circuit shown Fig-3 - 6

2(b) Determine the current through 10Ω resistor by using superposition theorem, shown in Fig-4 - 5

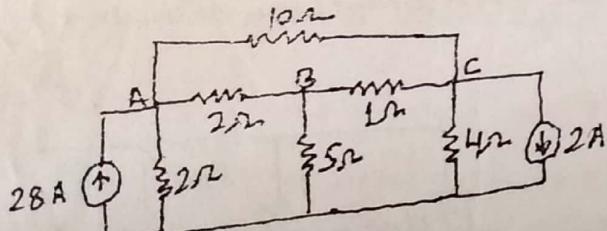


Fig-3

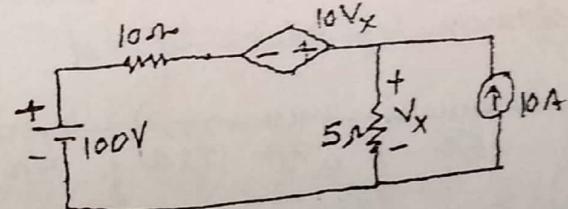


Fig-4

2(c) Prove that resistance of Delta connected is three times of star connected resistance, where all the resistances are equal in both the systems. - 3

3(a) For the trapezoidal current waveform. Determine the form factor of the fig-5 - 9

3(b) Two circuits, the impedances of which are given by $Z_1 = (6 + j8)\Omega$ and $Z_2 = (8 - j6)\Omega$ are connected

(2)

in parallel. If the applied voltage to the combination is 100 Volts, find (i) currents and power factor of each branch (ii) overall current and power factor of the combination. (iii) Power consumed by each impedance

- 5

- 4(a) Derive the expression of the parallel resonance of the ~~circuit~~ circuit shown in Fig-6

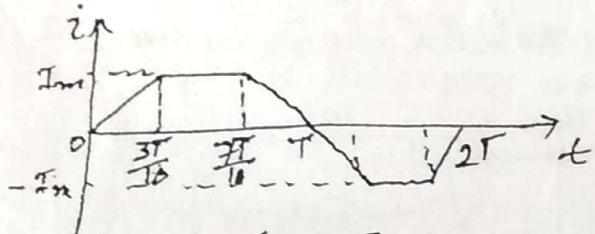
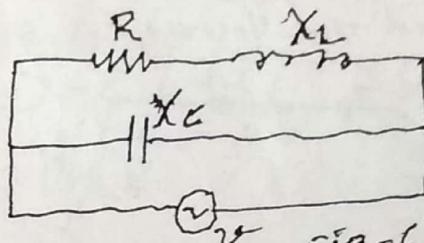


Fig - 5



- 4

- (b) In the network of Fig-7, find the value of V_2 , so that the current through $(2+j3)$ ohm impedance is zero.

- 5

- (c) Determine the load Z_L required to be connected in the network of the fig-8 for maximum power transfer and determine the maximum power drawn by the load

5

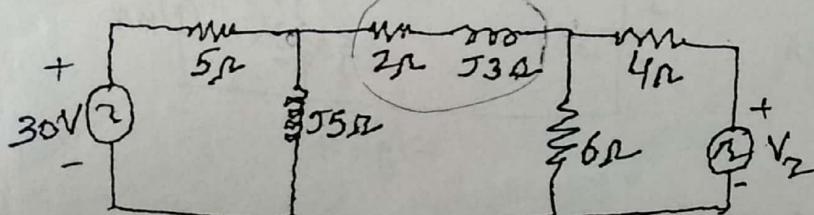


Fig - 7

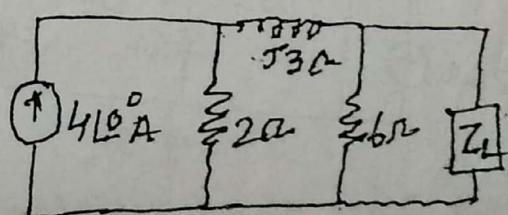


Fig - 8

- 5(a) What are differences between electrical circuits and magnetic circuits?

- 5

- (b) An iron ring made up of three parts, $L_1 = 12\text{ cm}$, $a_1 = 6\text{ cm}^2$, $L_2 = 10\text{ cm}$, $a_2 = 5\text{ cm}^2$, $L_3 = 8\text{ cm}$, $a_3 = 4\text{ cm}^2$ and air gap length $l_g = 2\text{ mm}$ for same cross-section area is a_3 . It is surrounded by a coil of 200 turns.

(3)

Determine the exciting current required to create a flux of 0.5 mwb in the iron ring. The relative permeability of all parts are equal and its 1200.

- 9

6(a) Three coils, having resistance and inductance of 8Ω and 0.02 H in each phase are connected in star in a three phase, $230 \text{ V}, 50 \text{ Hz}$ supply. Find the line current, power factor, power, reactive power and total Voltamperes — 8

6(b) Draw the power triangle and show the different powers — 2

4(c) What are the advantages of 3 phase system. — 4

7(a) Write the construction of single phase transformer. — 5

7(b) Derive an expression for the induced emf of a transformer. — 5

7(c) What are applications of transformer? — 4

8. Write short notes on following.

(a) Maximum power transfer theorem - 3

(b) Superposition theorem — 3

(c) Magnetic losses. — 4

(d) Principle of single phase transformer. — 4

— 'Q' —

Assume any missing data.

①

SET - I

Elements of Electrical Engineering LEE101

END SEMESTER EXAMINATION OF DECEMBER-15 (53)

Time - 3 hrs

FM - 70

Answer any five Questions.

- 1(a) Determine V_2 in fig-1, if $I_1 = -\frac{1}{2}e^{-2t}$, $V_3 = 2e^{-2t}$
and $V_4 = 5e^{-2t}$ ③ - 3

- 1(b) For the resistive circuit of fig-2, find I_{in} and V_x .
Also find R_1 and R_2 4

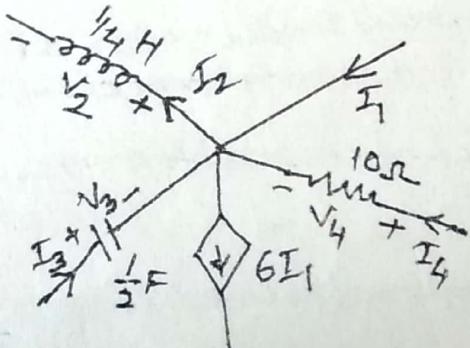


Fig-1

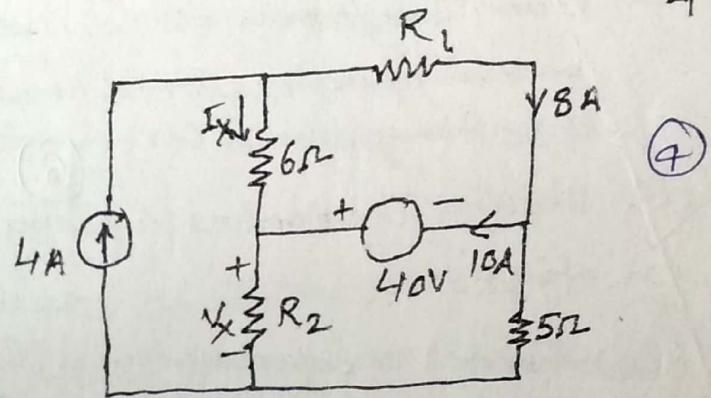


Fig-2

- 1(c) With the help of Star/Delta conversion, obtain the value of current supplied by the battery in the circuit shown in Fig-3 ⑦ - 7

- 2(a) Determine the value of I , so that $V_2 = 0$ in fig-4
use the superposition principle. - 7

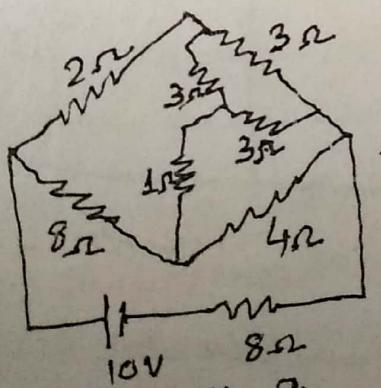


Fig-3

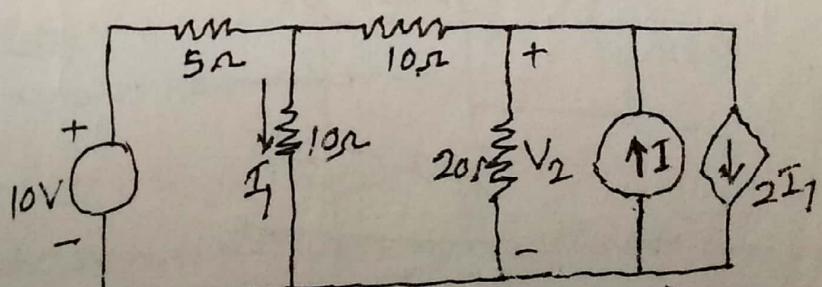


Fig-4

- 1(b) Find Norton's equivalent circuit at terminal A and B for the network of Fig-5 and determine the power dissipated in a 5Ω resistor to be connected between terminal A and B. - 7

- 3(a) Define Average and effective Value of A.C. Supply - (1)
- (b) Find the average value and rms value of the waveform shown in fig. 6 - 4

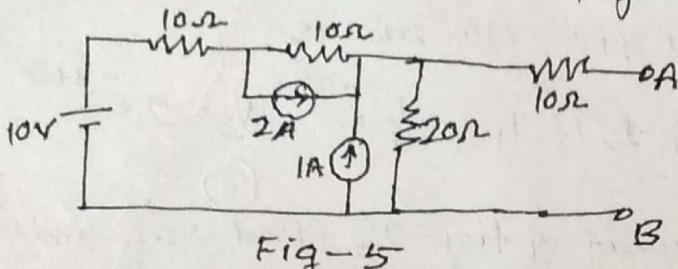
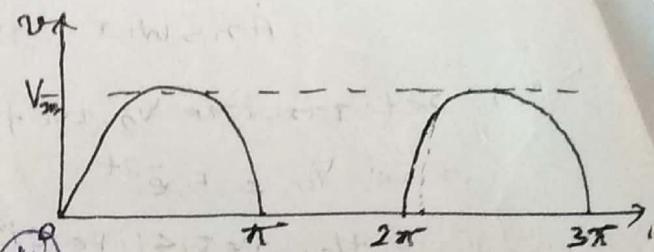


Fig-5



(4)

Fig-6

- (c) Prove that power will be zero, In the case of purely capacitive and purely inductive circuit, if voltages and currents are instantaneous values. (6) 3+3=6
- 4(a) Obtain Thevenin's equivalent network for the fig-7 - 5
- (b) State and explain Maximum power theorem for A.C circuit. (3) - 3
- (c) Find the impedance Z_L so that maximum power can be transferred to it in the network of fig-8, and find the maximum power. (6) - 6

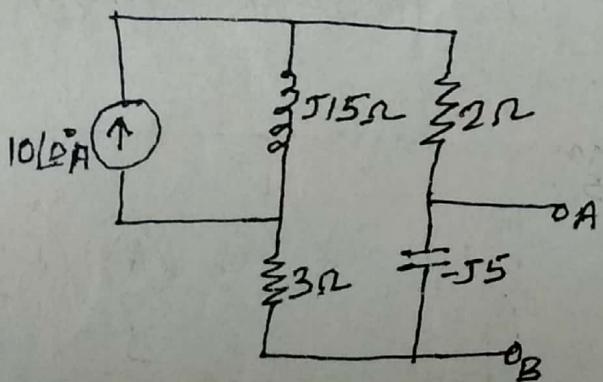


Fig-7

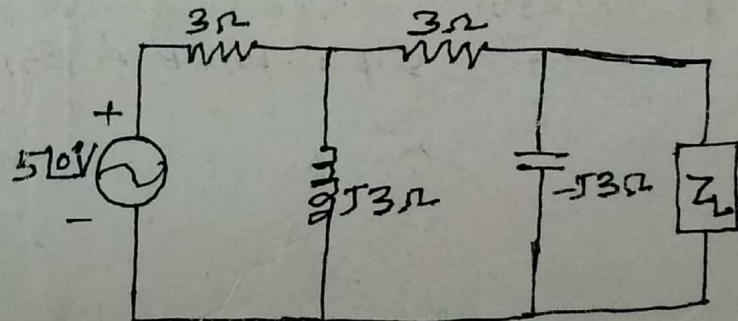
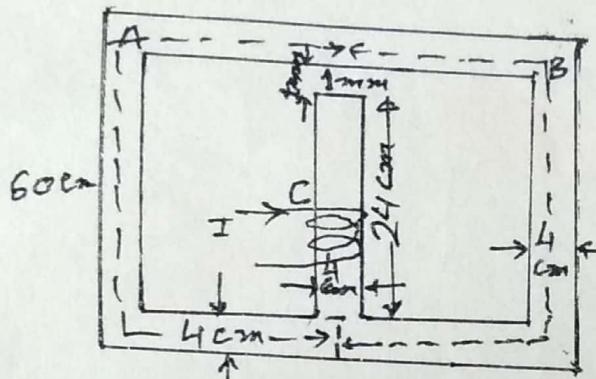


Fig-8

- 5(a) What are dissimilarities between Electric circuit and Magnetic circuit 5
- (b) A 680 turns coil is wound on the central limb of the last steel frame of 4cm x 4cm cross-section shown in fig-9 to send 1.6 mWb flux.

* in the air gap. Determine the current needed to produce this flux in the air gap. Assume the gap flux density is uniform and that all the flux passes straight through the gap. The relative permeability of cast steel is 600. — 9



$$L_B = 60\text{ cm} = 10$$

$$l_A = 60\text{ cm} = 60$$

$$L_c = 24\text{ cm}$$

$$L_g = 1\text{ mm}$$

Fig-9

- Q(9) What are advantages of Three phase system-
 (b) A 415V, 50Hz, three phase voltage is applied 4
 to three star-connected identical impedances. Each impedance consists of a resistance of 15Ω , a capacitance of $177\mu F$ and an inductance of 0.1 henry in series. Find the (i) Phase current (ii) Line current (iii) Power factor (iv) Active power (v) Reactive power and (vi) total VA. If the same impedances are connected in delta, find the (i) Line current (ii) Power consumed — 10

- 7- Write the short notes on following - 14 14
- (a) Superposition theorem (b) Thevenin's theorem.
 (c) Draw and Explain Hysteresis loop (d) Eddy current loss.

Note:- Assume any missing DATA.

— 0 —