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7. YEAR

### First Semester

Civil Engineering

GE 3151 — PROBLEM SOLVING AND PYTHON PROGRAMMING

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

PART A — ( $10 \times 2 = 20$  marks)

1. How does flow of control work?
2. Explain Towers of Hanoi problem.
3. Write a snippet to display "Hello World" in python interpreter.
4. Illustrate the use of \* and + operators in string with example.
5. Comment with an example on the use of local and global variable with the same identifier name.
6. Define Fruitful Function.
7. Relate String and List.
8. Let list= ['a', 'b', 'c', 'd', 'e', 'f']. Find the following
  - (a) List [1:3]
  - (b) t[:4]
  - (c) t[3:].
9. How does try and execute work?
10. How do you handle the exception inside a program when you try to open a non-existent file?

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PART B — (5 × 16 = 80 marks)

11. (a) (i) Compare and contrast machine language, assembly language and high-level language in detail.
- (ii) Give the difference between recursion and iteration.

Or

- (b) Explain in detail about the Notation of Algorithm.
12. (a) What is the role of an interpreter? Give a detailed note on python interpreter and interactive mode of operation. Explain how Python works in interactive mode and script mode with examples.

Or

- (b) Explain in detail about precedence of python operators and the associativity of python operators.
13. (a) Write a Python program to find the square root of a number without using inbuilt function and explain the same.

Or

- (b) Write a Python program for linear search and binary search and explain its implementation in detail.
14. (a) Demonstrate with Python code the various operations that can be performed on tuples.

Or

- (b) Define Dictionary in python. Do the following operations on dictionaries.
- (i) Initialize two dictionaries with key and value pairs.
- (ii) Compare two dictionaries with master key list and print missing keys.
- (iii) Find keys that are in first and not in second dictionary.
- (iv) Find same keys in two dictionaries.
- (v) Merge two dictionaries and create a new dictionary using a single expression.
15. (a) Explain about the file reading and writing operations using format operator with python code.

Or

- (b) Write a Python program to dump objects to a file using pickle.



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**Question Paper Code : 30508**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

CY 3151 – ENGINEERING CHEMISTRY

(Common to: All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the harmful effects of silica present in boiler feed water.
2. What is caustic embrittlement? Mention any one method to prevent it.
3. What are nanoparticles?
4. Write the principle involved in the sol-gel process.
5. What are the uses of a phase diagram?
6. Name any two applications of fiber reinforced laminates.
7. Define octane number. How can it be improved?
8. What is trans - esterification?
9. What are the drawbacks of nuclear energy?
10. Will the emf of a battery vary with size? Give reason.

PART B — (5 × 16 = 80 marks)

11. (a) (i) List the important requirements for drinking water. Briefly describe the various steps involved in the treatment of water for domestic purpose. (8)  
(ii) What is desalination? Explain reverse osmosis process and mention any two advantages of reverse osmosis. (8)

Or

- (b) (i) Explain the mechanism of ion exchange process of water treatment. Give any two advantages of it over zeolite process. (8)
- (ii) What are internal conditioning of water? How is internal treatment of boiler feed water carried out using phosphate and calgon conditioning? (8)
12. (a) (i) What are carbon nanotubes? Write the fabrication and structure of carbon nanotubes. (8)
- (ii) Write a note on the size dependence properties of nanomaterials. (8)
- Or
- (b) Explain the applications of nanomaterials in medicine, agriculture, energy and catalysis.
13. (a) (i) Draw and discuss the phase diagram of Pb-Ag system. Discuss Pattinson process based on phase rule. (8)
- (ii) Draw schematically the phase diagram of the water system and apply the Gibbs phase rule to interpret it. (8)
- Or
- (b) Explain the various constitution of composites with elaborate examples. (16)
14. (a) (i) Calculate the higher and lower calorific values of a coal sample having the following composition:  
Carbon = 80%, Hydrogen = 7%, Oxygen = 3%, Sulphur = 3.5%, Nitrogen = 2.1% and ash = 4.4%. (8)
- (ii) Explain the process involved in the preparation of liquid fuels from solid coal. (8)
- Or
- (b) Explain the principle working and significance of flue gas analysis by Orstat's method.
15. (a) (i) Write a note on breeder reactor. (8)
- (ii) How is wind energy harnessed? Mention its advantages and limitations. (8)
- Or
- (b) (i) Explain the construction and working of lead acid battery. (8)
- (ii) Describe the construction and working  $H_2$ - $O_2$  fuel cells. (8)



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**Question Paper Code : 30516**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

PH 3151 — ENGINEERING PHYSICS

(Common to All Branches)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ( $10 \times 2 = 20$  marks)

1. Define Center of Mass.
2. State law of conservation of angular momentum.
3. Write down the properties of Electromagnetic waves.
4. What is polarization?
5. Define total internal reflection.
6. Differentiate between laser and ordinary light.
7. What are matter waves?
8. What is the physical significance of a wave function?
9. State the principle of resonant diode.
10. What is quantum harmonic oscillator?

PART B — ( $5 \times 16 = 80$  marks)

11. (a) State and prove parallel and perpendicular axis theorem with a neat sketch.

Or

- (b) Derive the period of torsional pendulum and arrive at the equation of torsional rigidity.

12. (a) Derive the Maxwell's equations for a plane electromagnetic waves in vacuum.

Or

- (b) Describe the production of plane Electromagnetic waves in detail.

13. (a) Describe the design and working of CO<sub>2</sub> laser with energy level diagram.

Or

- (b) Derive Einstein Co-efficients for spontaneous and stimulated Emission.

14. (a) Derive Schrödinger time independent and dependent wave equations.

Or

- (b) Determine the energy of a particle confined in one dimensional potential well and find the normalization of wave function to study the behavior inside the potential well.

15. (a) Explain the principle, construction and working of scanning tunneling microscope with a neat sketch.

Or

- (b) Prove the Bloch theorem for particles in periodic finite potential well.



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## Question Paper Code : 70132

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

First Semester

Civil Engineering

MA 3151 – MATRICES AND CALCULUS

(Common to : All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

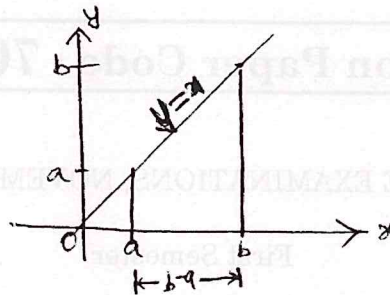
Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. The eigenvalues and the corresponding eigenvectors of a  $2 \times 2$  matrix is given by  $\lambda_1 = 8$ ;  $x_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$  and  $\lambda_2 = 4$ ;  $x_2 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ . Find the corresponding matrix.
2. Determine the nature, index and signature of the quadratic form  $x_1^2 + 5x_2^2 + x_3^2 + 2x_2x_3 + 6x_3x_1 + 2x_1x_2$ .
3. For what values of the constant  $c$  is the function  $f$  continuous on  $(-\infty, \infty)$ ?  
$$f(x) = \begin{cases} cx^2 + 2x; & x < 2 \\ x^3 - cx; & x \geq 2 \end{cases}$$
4. Find the slope of the circle  $x^2 + y^2 = 25$  at  $(3, -4)$ .
5. Find  $\frac{\partial^2 w}{\partial x \partial y}$ , if  $w = xy + \frac{e^y}{y^2 + 1}$ .
6. Find  $\frac{\partial w}{\partial r}$  and  $\frac{\partial w}{\partial s}$  in terms of  $r$  and  $s$  if  $w = x^2 + y^2$ ,  $x = r - s$  and  $y = r + s$ .
7. Evaluate  $\int \frac{\tan x}{\sec x + \tan x} dx$ .

8. Find the area of the region shown in the diagram given below, bounded between  $x = a$  and  $x = b$ .



9. Sketch the region of integration in  $\int_0^1 \int_x^1 f(x, y) dy dx$ .
10. Change the Cartesian integral  $\int_0^6 \int_0^y x dx dy$  into an equivalent polar integral.

PART B — (5 × 16 = 80 marks)

11. (a) Obtain an orthogonal transformation which will transform the quadratic form  $Q = 2x_2x_3 + 2x_3x_1 + 2x_1x_2$  to canonical form.

Or

- (b) An elastic membrane in the  $x_1x_2$ -plane with boundary circle  $x_1^2 + x_2^2 = 1$  is stretched so that a point  $P = (x_1, x_2)$  goes over a point  $Q = (y_1, y_2)$  given by  $y_1 = 5x_1 + 3x_2$  and  $y_2 = 3x_1 + 5x_2$ . Find the principal directions that is, the directions of the position vector  $x$  of  $P$  for which the direction of the position vector  $y$  of  $Q$  is the same or exactly opposite. What shape does the boundary circle take under this deformation?

12. (a) (i) Find  $y''$  if  $x^4 + y^4 = 16$ . (8)
- (ii) Differentiate  $y = (2x+1)^5 (x^3 - x + 1)^4$ . (8)

Or

- (b) Find the intervals on which  $f(x) = -x^3 + 12x + 5$ ;  $-3 \leq x \leq 3$  is increasing and decreasing. Where does the function assume extreme values? What are those values?



13. (a) Find the maximum and minimum values of the function  $f(x, y) = 3x + 4y$  on the circle  $x^2 + y^2 = 1$ .

Or

- (b) Find the Taylor series expansion of the function  $f(x, y) = \sin x \sin y$  near the origin.

14. (a) (i) Evaluate  $\int_0^{\infty} e^{-ax} \sin bx dx$ , for  $a > 0$ . (8)

(ii) Integrate  $\int_0^{\pi/2} \frac{\sin x \cos x}{\cos^2 x + 3 \cos x + 2} dx$ . (8)

Or

(b) (i) Evaluate  $\int \frac{3x^4 + 3x^3 - 5x^2 + x - 1}{x^2 + x - 2} dx$ . (8)

(ii) Integrate  $\int x \sqrt{1 + x - x^2} dx$ . (8)

15. (a) (i) Change the order of integration in  $\int_0^1 \int_{x^2}^{2-x} xy dy dx$  and hence evaluate. (8)

(ii) Find the area of the region inside the cardioid  $r = a(1 + \cos \theta)$  and outside the circle  $r = a$ . (8)

Or

(b) Find the volume of the region bounded by the paraboloid  $z = x^2 + y^2$  and the plane  $z = 4$ . (16)





Reg. No. :

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**Question Paper Code : 70126**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Civil Engineering

HS 3151- PROFESSIONAL ENGLISH – I

(Common to: All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Choose the best option to complete the given sentences: (4 × ½ = 2)
- (i) I am planning to \_\_\_\_\_ in May or June.
- (a) get a holiday (b) have a holiday  
(c) make a holiday (d) go on a holiday
- (ii) I wouldn't do that if I were you. You are making a \_\_\_\_\_
- (a) huge mistake (b) biggest mistake  
(c) great mistake (d) massive mistake
- (iii) After \_\_\_\_\_, we decided not to buy the new equipment for the lab.
- (a) caring consideration (b) deliberate consideration  
(c) careful consideration (d) genuine consideration
- (iv) Our company is always on the \_\_\_\_\_ young and talented programmers.
- (a) search for (b) look out for  
(c) demand for (d) need for
2. Write a definition for any two of the following: (2 × 1 = 2)
- (a) Modem  
(b) Dictionary  
(c) GPS  
(d) Photo Copier

3. Fill in the blanks with appropriate tense forms. (4 × ½ = 2)

- (a) I \_\_\_\_\_ (work) for the company for thirty years. Then I gave it all up.
- (b) After Ravi \_\_\_\_\_ (swallow) his medicine, he \_\_\_\_\_ (begin) to feel better.
- (c) I \_\_\_\_\_ (just / finish) my assignment.

4. Combine the following sentences using appropriate causal expressions. (2 × 1 = 2)

- (a) The cyclone blew the roof off our house. We had to find another place to live.
- (b) The ocean is extremely polluted. The coral reefs die.

5. Complete the following table with suitable form of words: (8 × ¼ = 2)

Noun	Verb	Adjective
Addition		
	Confide	
		Equal
Strength		

6. Complete the following sentences using an appropriate form of the verb given in the brackets. (4 × ½ = 2)

- (a) My friends who are in the district team \_\_\_\_\_ (want / wants) me to play with them.
- (b) Neither the cat nor the dogs \_\_\_\_\_ (is/ are) going outside.
- (c) Even though the students like the class, a few \_\_\_\_\_ (think / thinks) that the subject is too complicated.
- (d) The samples on the tray in the Geology lab \_\_\_\_\_ (need/ needs) testing.

7. Choose the correct one word substitute for the given phrases: (4 × ½ = 2)

- (a) An act of returning something that was lost or stolen to its owner:
- (i) Duty (ii) Restitution (iii) Atonement (iv) Reference
- (b) An excessively morbid desire to steal
- (i) Dipsomania (ii) Megalomania (iii) Pyromania (iv) Kleptomania



(c) Animals without backbone are called

(i) Vertebrates (ii) Amphibians (iii) Invertebrates (iv) Omnivores

(d) Changing from one state or condition to another

(i) Transition (ii) Backtrack (iii) Tweak (iv) Incision

8. Frame two sentences using any two of the phrasal verbs given below:

(2 × 1 = 2)

(a) broke into (b) look forward to (c) show up (d) back off

9. Frame any four compound nouns from the given words. You can use one word only once.

(4 × ½ = 2)

back	pan	eye	track	pour
down	sound	ground	witness	sauce

10. Frame wh-questions for the following statements.

(2 × 1 = 2)

(a) I got this sculpture from the new gallery in the city.

(b) Ravi met his old friend in the stadium last night.

PART B — (5 × 16 = 80 marks)

11. Read the following passage and answer the questions given below:

### The Upside of Dyslexia

We live in a society where reading is very important-not just for school, but for daily life. (Think street signs, maps, medicine labels, and allergy labels on food packaging.) So life can be hard for people with dyslexia. Dyslexia is a learning disability that affects a person's reading ability. For people with dyslexia, the parts of their brains that process language aren't functioning the way they're supposed to.

According to the American Academy of Pediatrics, dyslexia was the most common learning disability in 2011. It is still common today. However, people with dyslexia can learn to cope with the disability so that they can succeed in life.

Says Emerson Dickman, president of the International Dyslexia Association in Baltimore: "Individuals who have difficulty reading and writing tend to deploy other strengths. They rely on mentors, and as a result, become very good at reading other people and delegating duties to them. They become adept at using visual strengths to solve problems."



Take, for example, Richard Branson, the successful founder of Virgin Atlantic Airways, who credits his dyslexia as his 'greatest strength.' As he explains it, he "got bored easily" in school because he couldn't read well, and teachers thought he was simply "lazy and not very clever." So he spent most of his time visualizing all the things he would do when he left school. After launching his first business at 16, he went on to start eight different companies and amass billions of dollars. "On one of my last days at school, the headmaster said I would either end up in prison or become a millionaire," Branson recalls. "That was quite a startling prediction, but in some respects he was right....!"

Branson is not the only entrepreneur who is dyslexic. In 2007, Julie Logan, a professor of entrepreneurship at the Cass Business School in London, did a study on entrepreneurs in the United States. Thirty-five percent of the entrepreneurs in the study identified themselves as dyslexic.

"We found that dyslexics who succeed had overcome an awful lot in their lives by developing compensatory skills," says Logan. 'If you tell your friends and acquaintances that you plan to start a business, you'll hear over and over, 'It won't work. It can't be done.' But dyslexics are extraordinarily creative about maneuvering their way around problems."

Well-known journalist Anderson Cooper, who has visited many battle-torn areas and conducted interviews about tough subjects, knows this fact firsthand. Diagnosed as dyslexic as a child, he relied on the help of a reading specialist. He says that she encouraged him to find books he was very passionate about. I don't think it's an accident that I became a war correspondent." Cooper says. "I'm interested in stories of survival: how some people make it through desperate times and others don't."

The television and film world also boasts a number of other dyslexic superstars. For example, Whoopi Goldberg, an Oscar-winning actress and comedian, was diagnosed with dyslexia after suffering through her school years. When she was a child, she couldn't understand why she struggled so much with reading.

"You can never change the effect that the words 'dumb' and 'stupid' have on young people," says Goldberg. However, she says, "I knew I wasn't stupid, and I knew I wasn't dumb. My mother told me that."

Now, Goldberg defines herself as a person who believes that "it is okay to feel differently than the pack." When asked about what it takes to be successful? Goldberg says, "We're born with success. It is only others who point out our failures and what they attribute to us as failure."

Clearly, people with dyslexia may face many obstacles. However, they shouldn't be discouraged. There are ways they can cope with it and lead very successful lives.



(A) Answer the following questions based on the passage: (10 × 1 = 10)

- (1) According to the text, what does dyslexia affect?
  - (a) Living a successful life
  - (b) People who are lazy
  - (c) The American Academy of Pediatrics
  - (d) A person's reading ability
- (2) What does the author describe in the passage?
  - (a) Entrepreneurs who identifies themselves as dyslexic
  - (b) How Anderson Cooper became a war correspondent
  - (c) Celebrities who are coping with their dyslexia
  - (d) How Richard Branson founded Virgin Atlantic Airways
- (3) Richard Branson was not very successful in school. What evidence from the passage best supports this conclusion?
  - (a) Branson's teachers thought he was lazy and not very smart.
  - (b) Branson spent his time visualizing what he would do when he left school
  - (c) Branson credits dyslexia as "his greatest strength."
  - (d) Branson launched his first business at sixteen and started eight companies.
- (4) Why might Whoopi Goldberg have been called "dumb" or "stupid"?
  - (a) Because she thought she could become a famous actress
  - (b) Because she was not as intelligent as her classmates
  - (c) Because she listened to what her mother said
  - (d) Because she struggled so much with reading
- (5) The phrase "compensatory skills" in the passage means
  - (a) Skills that are not necessary for life
  - (b) Skills that can only be gained from practice
  - (c) Skills that make up for a weakness
  - (d) Skills that are taught in textbooks
- (6) Choose the answer that best completes the sentence below:

Dyslexic people have trouble reading and understanding text, \_\_\_\_\_ they often develop ways to cope with dyslexia.

(a) so	(b) after
(c) for example	(d) otherwise



- (7) In the line, " Well-known journalist Anderson Cooper, who has visited many battle-torn areas and conducted interviews about tough subjects knows this fact firsthand." What is the fact referred by the author in this context?
- (a) cynical behaviour (b) creative manoeuvring  
(c) statistics about battles (d) importance of reading
- (8) Who considered dyslexia as their 'greatest strength'?
- (a) Richard Branson (b) Goldberg  
(c) Julie Logan (d) Anderson Cooper
- (9) In the sentence, '*it is okay to feel differently than the pack*', who does the pack refers to?
- (a) pack of cards (b) her family  
(c) friends (d) all other people
- (10) What is author's opinion about dyslexia?
- (a) He feels people with such disease should be given personal care  
(b) Dyslexic people, in spite of many obstacles, shouldn't be discouraged.  
(c) People with dyslexia are mostly educated people  
(d) Dyslexia, as a disease has affected mostly poorer children
- (B) Say True or False (3 × 1 = 3)
- (1) Dyslexia is a chronic disease that is genetic in nature.  
(2) After undergoing suffering during school days, Whoopi Goldberg today feels that it is okay to be different from others.  
(3) In a study conducted to find about dyslexic people, it was found that more than 50% of the study population were dyslexic.
- (C) Choose the right meaning for the highlighted words: (3 × 1 = 3)
- (1) What is a 'startling prediction'?
- (a) amazing (b) shocking  
(c) disquieting (d) humbling
- (2) 'To become adept at' means?
- (a) to become interested  
(b) to become addled  
(c) to become proficient  
(d) to become shocked

(3) What did the author mean when he says 'tend to deploy'?

- (a) likely to use
- (b) tired to attend
- (c) told to arrange
- (d) tasked to play

12. (a) You are a member of the Cyber Club in your college. As part of social media awareness, your club plans to put up posters about Cyber Crimes. You have been asked to put up a set of eight instructions that have to be followed by users on social media. Your set of instructions should comprise of dos and don'ts in social media for teenagers.

(16)

Or

- (b) As a volunteer for a NCC event, you have been asked to put up a poster for Road Safety week in your city. Your poster should have a set of eight recommendations that have to be followed for safe driving in the city. (16)

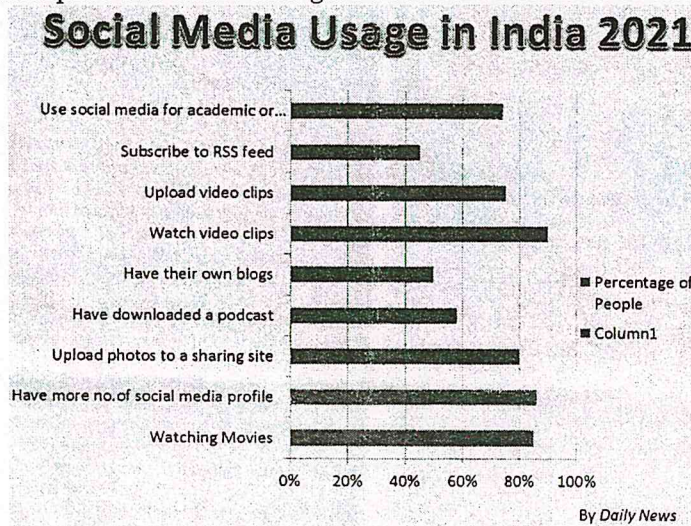
13. (a) Your class had a gone for a field visit to an industry. As the Class Representative, you have been asked to write a short report of the visit to your Head of the Department Write an email to your Head of the Department about this visit and enclose a short report of the same. (16)

Or

- (b) You are the Student President of your college. You are organizing an inter-college technical festival for two days. You would like to invite the CEO of a reputed social media company. Invite him by email with a short report about technical festival that you are organizing. (16)

14. Choose any one of the diagram and write a detailed description and interpretation for the same in not more than 200 words.

- (a) The following bar chart depicts the social media usage in India. Describe and interpret the chart and give recommendations to the users. (16)

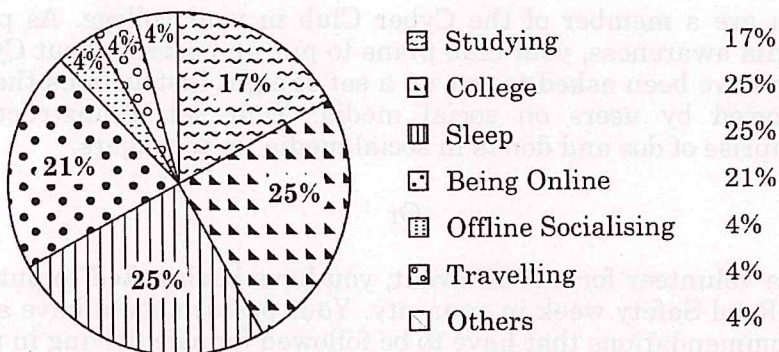


Or



- (b) The following pie chart depicts the daily routine of a college student. Describe and interpret the chart and give recommendations on better time management.

A College Student's Daily Routine



15. Write an essay on any one of the topics for not more than 300 words. (16)

(a) Your first day of college (face-to-face class)

Or

(b) Your favorite place.



Reg. No. :

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**Question Paper Code : 30509**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

GE 3151 – PROBLEM SOLVING AND PYTHON PROGRAMMING

(Common to: All Branches)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write an algorithm to find the sum of first 'N' natural numbers.
2. Distinguish between top down and bottom up approaches to design an algorithm.
3. What is slicing operator in python? Give an example.
4. Python variables do not have specific types. Justify this statement using an example.
5. Write a python program to add two matrices.
6. Write a simple function to multiply two numbers in python.
7. Write a program to create a clone of the list: list 1 = [1,2,3,4,5,6].
8. How are the values of tuples accessed? Illustrate with an example.
9. Define relative path and absolute path with respect to files.
10. What are exceptions?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the different building blocks of algorithms with their notations. (10)

- (ii) Write an algorithm to find an element in the given set of numbers. (6)

Or

- (b) (i) What is meant by recursion? Write a recursive algorithm to solve Towers of Hanoi problem. (8)

- (ii) Draw a flowchart to check if the given word is palindrome. (8)

12. (a) (i) Write a program to find the roots of a quadratic equation given the coefficients a, b, c. (8)

- (ii) Describe the shift and logical operators used in python with examples. (8)

Or

- (b) (i) Elaborate on membership, identity and bitwise operators of python with suitable examples. (12)

- (ii) Write a program to print the digit at one's place of a number. (4)

13. (a) (i) Describe the conditional branching statements of python with examples. (8)

- (ii) Write the syntax of while loop and use the same to classify if a given number is prime or not. (8)

Or

- (b) (i) Describe parameter passing in functions using examples. (8)

- (ii) Discuss about the scope and lifetime of variables considering functions. (8)

14. (a) (i) Describe the addition and deletion operation in a list data structure with examples. (8)

- (ii) Write a program that has a nested list to store topper details and display the details. (8)

Or

- (b) (i) Discuss the basic tuple operations with examples. (8)
- (ii) Write a program to swap two values using tuple assignment. (8)
- 15. (a) (i) Explain opening and closing of files in python using examples. (8)
- (ii) Write a program to display the contents of a file by performing split operation whenever a comma is encountered in a file. (8)

Or

- (b) (i) Explain the use of packages and modules in python with examples. (8)
  - (ii) Write a program to handle the division by zero exception. (8)
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Reg. No. :

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**Question Paper Code : 30515**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Civil Engineering

MA 3151 – MATRICES AND CALCULUS

(Common to: All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Two eigen values of the matrix  $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$  are 3 and 0. Find the third eigen value and also find the product of eigen values of A.

2. Write the quadratic form corresponding to the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -2 & -4 \\ 3 & -4 & -3 \end{bmatrix}$ .

3. Find the domain of the function  $f(x) = \frac{1}{x^2 - x}$ .

4. Prove that  $\lim_{x \rightarrow 0} \frac{|x|}{x}$  does not exist.

5. Find  $\frac{dy}{dx}$ , if  $x^3 + y^3 = 3axy$ .

6. If  $u = \frac{y^2}{x}$  and  $v = \frac{x^2}{y}$ , then find the Jacobian  $\frac{\partial(u,v)}{\partial(x,y)}$ .

7. Evaluate  $\int \frac{\cos \theta}{\sin^3 \theta} d\theta$  by the method of substitution.



8. Determine the following integral is convergent or divergent.  $\int_0^{\infty} e^x dx$ .
9. Evaluate  $\int_1^2 \int_2^5 [xy] dx dy$ .
10. Find the limits of the integration  $\iint_R f(x, y) dx dy$  where R is the region bounded by the lines  $x = 0$ ,  $y = 0$  and  $x + y = 2$ .

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the eigen values and eigen vectors for the matrix
- $$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix} \quad (8)$$
- (ii) Using Cayley-Hamilton theorem, find the inverse of the matrix
- $$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}. \quad (8)$$

Or

- (b) Reduce the quadratic form  $8x_1^2 + 7x_2^2 + 3x_3^2 - 12x_1x_2 - 8x_2x_3 + 4x_3x_1$  to the canonical form through an orthogonal transformation. (16)
12. (a) (i) Find the equation of the tangent line to the curve  $y = \frac{e^x}{(1+x^2)}$  at the point  $(1, e/2)$ . (8)
- (ii) Find the absolute maximum and minimum values of the function  $f(x) = \log(x^2 + x + 1)$  in  $[-1, 1]$ . (8)

Or

- (b) (i) Show that the function  $f(x)$  is continuous on  $(-\infty, \infty)$
- $$f(x) = \begin{cases} 1 - x^2; & x \leq 1 \\ \log x; & x \geq 1 \end{cases} \quad (8)$$
- (ii) Find the local maxima and minima for the function of the curve  $y = x^4 - 4x^3$ . (8)

13. (a) (i) If  $u = \sin^{-1} \left[ \frac{x^3 - y^3}{x + y} \right]$  then prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \tan u$ . (8)

(ii) Find the maximum and minimum values of  $f(x, y) = x^2 - xy + y^2 - 2x + y$ . (8)

Or

(b) (i) Using Taylor's series, expand  $f(x, y) = x^2y + \sin y + e^x$  upto the second degree terms at the point  $(1, \pi)$ . (8)

(ii) A rectangular box open at the top is to have a volume of 32 cc. Find the dimensions of the box requiring the least material for its construction. (8)

14. (a) (i) Evaluate  $\int x^2 e^x dx$  by using integration by parts. (8)

(ii) Evaluate  $\int \frac{dx}{\sqrt{3x^2 + x - 2}}$  (8)

Or

(b) (i) Evaluate  $\int \frac{x + 4}{6x - 7 - x^2} dx$ . (8)

(ii) Evaluate  $\int_{-\pi/4}^{\pi/4} [\tan^2 x \sec^2 x] dx$ . (8)

15. (a) (i) Change the order of integration in  $\int_0^a \int_x^a (x^2 + y^2) dy dx$  and hence evaluate it. (8)

(ii) Evaluate  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$  by changing into polar coordinates. (8)

Or

(b) (i) Evaluate  $\iint (x^2y + xy^2) dx dy$  over the area between  $y = x^2$  and  $y = x$ . (8)

(ii) Evaluate  $\int_0^1 \int_0^x \int_0^{\sqrt{x+y}} [z] dz dy dx$ . (8)





Reg. No. :

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**Question Paper Code : 30510**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

GE 3152 – HERITAGE OF TAMILS

(Common to All branches)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. செம்மொழி என்றால் என்ன?  
What is Classical Language?
2. நாலாயிரத் திவ்ய பிரபந்தம் பாடிய ஆழ்வார்களின் எண்ணிக்கை?  
Number of Aalvaargal who sang four thousand Divya Prabandham?
3. நடுகல் என்றால் என்ன?  
What is hero stone?
4. ஐம்பொன்னில் கலந்துள்ள உலோகங்கள் யாவை?  
What are the metals in Bronze?
5. தோல்பாவைக் கூத்து என்றால் என்ன?  
What is leather puppetry?
6. தமிழர்களின் வீர விளையாட்டுக்களின் பெயர்களுள் நான்கினை எழுதுக.  
Write any four of the names of heroic sports of Tamils.
7. புறம் என்பதன் பொருள் யாது?  
What is Puram?



8. சங்க காலத் துறைமுகங்களின் பெயர்களுள் நான்கினைக் குறிப்பிடுக.

Name any four ports of the Sangam age.

9. கல்வெட்டுகளின் நோக்கம் என்ன?

What was the purpose of the inscriptions?

10. தமிழக வரலாறும் மக்களும் பண்பாடும் என்ற நூலின் ஆசிரியர் யார்?

Who is the author of Tamilnadu History and People and Culture?

PART B — (5 × 16 = 80 marks)

Q.No. 11 is Compulsory.

11. திருக்குறளில் இடம்பெற்றுள்ள மேலாண்மைக் கருத்துக்களை விளக்குக.

Explain the management concepts contained in Thirukkural.

12. (a) பழங்குடியினர்கள் தயாரிக்கும் கைவினைப் பொருட்களைப் பட்டியலிடுக.

Explain handicrafts made by tribals.

Or

- (b) தமிழர்கள் தம் வாழ்வில் பயன்படுத்திய இசைக்கருவிகளை அறிமுகம் செய்க.

Introduce musical instruments used by Tamils in their life.

13. (a) தமிழர்களின் வாழ்வில் 'வில்லுப்பாட்டுப்' பெறுமிடத்தை எடுத்துரைக்க.

To highlight the role of 'Villu Pattu' in the lives of Tamils.

Or

- (b) தெருக்கூத்தின் அமைப்பு மற்றும் ஆடல் முறைகளை விளக்குக.

Explain the structure and methods of dance of 'Therukoothu'.

14. (a) சங்க இலக்கிய அகக் கோட்பாட்டினைத் தெளிவுப்படுத்துக.

Explain the Aham Concept of Sangam literature.

Or

- (b) சங்க காலத்தில் நடைபெற்ற ஏற்றுமதி மற்றும் இறக்குமதி வணிகங்களை விளக்குக.

Explain the export and import trades that took place during the Sangam age.

15. (a) சுயமரியாதை இயக்கம் என்றால் என்ன? அதன் செல்நெறிகளை விளக்குக.

What is self-respect movement? Explain its mechanisms.

Or

- (b) இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு என்னும் தலைப்பில் கட்டுரை எழுதுக.

Write an essay on 'Contribution of Tamils to Indian Freedom Struggle'.





Reg. No. :

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**Question Paper Code : 30513**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

HS 3152 – PROFESSIONAL ENGLISH – I

(Common to: All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Expand the following Acronyms:
  - (a) IMAX,
  - (b) PIN.
2. Frame Tag Questions for the given sentences.
  - (a) He has completed the project, \_\_\_\_\_?
  - (b) This will work, \_\_\_\_\_?
3. Choose the correct verb that agrees with the subject.
  - (a) The percentage of employees who called in sick and the number of employees who left the jobs within 3 years \_\_\_\_\_ (is / are) reflective of the level of job satisfaction.
  - (b) Neither alternative hypothesis \_\_\_\_\_ (is / was) accepted.
4. Select the suitable phrasal verbs to complete the sentences.
  - (a) The terrorists tried to \_\_\_\_\_ (blow out / blow up) the railroad.
  - (b) I \_\_\_\_\_ (tried on / tired out) five cars before I could find one that pleased me.



5. Complete the sentence with the appropriate tense:
  - (a) I \_\_\_\_\_ (complete) my assignments yesterday.
  - (b) Remedial classes \_\_\_\_\_ (hold) every Thursday.
6. Pick out the Compound noun from the sentence:
  - (a) "The Water Pollution across the country is a closely-monitored media event".
  - (b) The rainbow appeared between the two mountains.
7. Complete the sentences using appropriate article.
  - (a) We update \_\_\_\_\_ website of our institution regularly.
  - (b) We need \_\_\_\_\_ updated CV.
8. Copy an appropriate adjective + noun collocation to complete the sentence.
  - (a) There is a \_\_\_\_\_ of academic support offered for vernacular medium students.
    - (i) various range
    - (ii) wide range
    - (iii) vast range
  - (b) Consumers are usually willing to pay more for a \_\_\_\_\_ product.
    - (i) High level
    - (ii) High quality
    - (iii) High rate
9. Punctuate the given sentences correctly.
  - (a) A text book can be a wall between teacher and class
  - (b) It is a fine idea let us hope that it is going to work
10. Choose the correct possessive pronoun or relative pronoun to complete the sentence. (2)
  - (a) \_\_\_\_\_ (You Yours, My, Mine) computer is a Mac, but \_\_\_\_\_ (you, your, yours, my) is a PC.
  - (b) We gave them \_\_\_\_\_ (ours, mine, our, yours) telephone numbers, and they gave us \_\_\_\_\_ (their, theirs, our, mine).

PART B — (5 × 16 = 80 marks)

11. (a) Read the following paragraph carefully and answer the questions.

(5 × 2 = 10)

The climbers carry with them packs loaded with first-aid supplies, food and extra clothing for sudden changes of weather. They display spirit of Sportsmanship and fellow feeling and face the severe risks of life undaunted feel. Mountain climbing is a common sport in Europe. There are mountaineering clubs where training in mountaineering is imparted.

- (i) What are the things the climbers carry with them while climbing a mountain?

- |                      |                        |
|----------------------|------------------------|
| (1) Water            | (2) First-aid supplies |
| (3) Bed              | (4) Medicine           |
| (5) Answer not known |                        |

- (ii) What kind of spirit they have?

- |                      |           |
|----------------------|-----------|
| (1) Sportsmanship    | (2) Anger |
| (3) Happy            | (4) Sad   |
| (5) Answer not known |           |

- (iii) Do they take any risk?

- |                      |            |
|----------------------|------------|
| (1) Yes              | (2) No     |
| (3) Rarely           | (4) Always |
| (5) Answer not known |            |

- (iv) Where does mountaineering occur more commonly in the world?

- |                      |            |
|----------------------|------------|
| (1) USA              | (2) India  |
| (3) Europe           | (4) London |
| (5) Answer not known |            |

- (v) Is there any club to train the climbers?

- |                      |            |
|----------------------|------------|
| (1) No               | (2) Yes    |
| (3) Scarcely         | (4) Common |
| (5) Answer not known |            |

- (b) Identify and write down atleast 6 transition words in the paragraph given below.

(6 × 1 = 6)

I'm going to discuss a few points why practice is important to mastering skills since practice makes a man perfect. Firstly, the only way to truly learn a skill is by actually performing what you'll have to do in the real world. Secondary, I think practice can be a fun way of putting in the necessary hours. There are, however, some people who will disagree. Thirdly, and most importantly, it is said that people tend to remember only 10-20% of what they read or hear. Moreover, that number rises to as much as 90% when you put theory to practice. In conclusion, following up explanation with practice is key to mastering a skill.



12. (a) Write a paragraph (150 words) on "The use and abuse of smart phone among student community". (16)

Or

- (b) Write a short report (150 words) on the industrial visit you have undertaken. (16)
13. (a) (i) Write a set of 10 instructions to be followed by the road users for the best and effective use of roads. (10)
- (ii) Put the following sentences in logical and coherent order. (6)

- (1) Initially it did start with a rumour.
- (2) Aahan and Kanishka are top stars of Kollywood cinema.
- (3) Aahan and Kanishka kept denying it.
- (4) Eventhough the entire State was talking about it.
- (5) Finally, the announcement of the new film was made.
- (6) But both of them haven't worked together in a film.

Or

- (b) Imagine that you bought 100 IBM computers for your institute. You as the Chief of the Processing Unit have to give instructions to your subordinate to install them. Write the process of installing them. As bullet points. (16)
14. (a) Write down any 10 recommendations for reducing Global Warming. (16)

Or

- (b) Interpret the following table and write a summary of 250 words. (16)

**People of a town working in various sectors.**

S.No	Employment sector	18-25 age group (in %)	25-40 age group (in %)	40-65 age group (in %)
1	Agriculture	2	7	19
2	Manufacturing	12	15	13
3	Catering	14	11	4
4	Local Govt	8	12	18
5	Health	10	12	12
6	Retail	23	7	6
7	Law	2	4	4
8	Accountancy	3	2	3
9	Education	6	12	12
10	Others	20	18	9

15. (a) Write an essay on "5G Technology". (16)

Or

- (b) Write an essay on "My vision for India @ 2047". (16)



Reg. No. :

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**Question Paper Code : 70077**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Civil Engineering

**CY 3151 — ENGINEERING CHEMISTRY**

(Common to : All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

**PART A — (10 × 2 = 20 marks)**

1. Why is calgon conditioning better than phosphate conditioning?
2. Write the importance of break point chlorination.
3. Write any two application of nanomaterials.
4. What are carbon nano tubes? What are its types?
5. Give the definition of a hybrid composite with an example.
6. Represent the reduced phase rule with an equation. When is it used?
7. Mention few advantages of diesel over petrol as a fuel.
8. Distinguish between octane number and cetane number.
9. What are the advantages of perovskite solar cells?
10. Write the definitions of critical mass and multiplication factor in a fission reaction.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the differences between (1) sludge and scale, (2) hard water and soft water (3) priming and foaming (4) internal treatment and external treatment. (8)
- (ii) Explain (1) cation and anion exchangers (2) COD and BOD measurement. (8)

Or

- (b) (i) With a neat diagram, explain the principle, process, advantages and limitations of Zeolite process. (8)
- (ii) Outline a method to determine various alkalinities in a given sample of water. (8)
12. (a) (i) Explain the differences between nanoparticle nanocluster, nanorod, nano wire and nanotube with respect to their structure, property and use. Give examples. (10)
- (ii) State and brief on any five applications of nanomaterials in medical field. (6)

Or

- (b) (i) Compare the optical, electrical, mechanical and magnetic properties of bulk and nanomaterials with examples. (10)
- (ii) How is carbon Nanotubes prepared by CVD process. (6)
13. (a) (i) Explain the one component water system with a phase diagram. Explain the system using phase rule. (12)
- (ii) Write a note on polymer matrix composites. (4)

Or

- (b) (i) Draw the lead silver phase diagram and explain using phase rule. (12)
- (ii) Write a note on Pattinson process. (4)
14. (a) (i) With a schematic diagram of the Orsat apparatus write the procedural steps involved in the flue gas analysis. (8)
- (ii) What is meant by knocking in IC engine? Explain the mechanism. (8)

Or

- (b) Discuss the manufacture of metallurgical coke by Otto Hoffmann method byproduct recovery method with a neat sketch. (16)

15. (a) Discuss the construction and working of a nuclear reactor with a neat diagram. Explain the functioning of its components in detail. (16)

Or

- (b) (i) Schematically represent a Li-ion battery and label its important features. (3)
- (ii) What is the difference between capacitor and a supercapacitor? (3)
- (iii) Write the anodic and cathodic reactions involved during charging and discharging of a Pb-Acid battery. (10)
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Reg. No. :

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**Question Paper Code : 70132**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

First Semester

Civil Engineering

MA 3151 – MATRICES AND CALCULUS

(Common to : All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

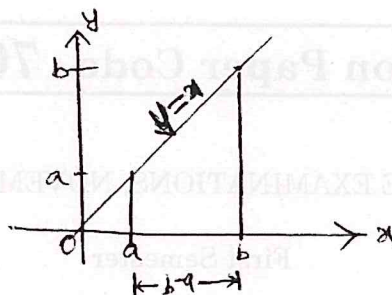
Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. The eigenvalues and the corresponding eigenvectors of a  $2 \times 2$  matrix is given by  $\lambda_1 = 8$ ;  $x_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$  and  $\lambda_2 = 4$ ;  $x_2 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ . Find the corresponding matrix.
2. Determine the nature, index and signature of the quadratic form  $x_1^2 + 5x_2^2 + x_3^2 + 2x_2x_3 + 6x_3x_1 + 2x_1x_2$ .
3. For what values of the constant  $c$  is the function  $f$  continuous on  $(-\infty, \infty)$ ?  
$$f(x) = \begin{cases} cx^2 + 2x; & x < 2 \\ x^3 - cx; & x \geq 2 \end{cases}$$
4. Find the slope of the circle  $x^2 + y^2 = 25$  at  $(3, -4)$ .
5. Find  $\frac{\partial^2 w}{\partial x \partial y}$ , if  $w = xy + \frac{e^y}{y^2 + 1}$ .
6. Find  $\frac{\partial w}{\partial r}$  and  $\frac{\partial w}{\partial s}$  in terms of  $r$  and  $s$  if  $w = x^2 + y^2$ ,  $x = r - s$  and  $y = r + s$ .
7. Evaluate  $\int \frac{\tan x}{\sec x + \tan x} dx$ .

8. Find the area of the region shown in the diagram given below, bounded between  $x = a$  and  $x = b$ .



9. Sketch the region of integration in  $\int_0^1 \int_x^1 f(x, y) dy dx$ .
10. Change the Cartesian integral  $\int_0^6 \int_0^y x dx dy$  into an equivalent polar integral.

PART B — ( $5 \times 16 = 80$  marks)

11. (a) Obtain an orthogonal transformation which will transform the quadratic form  $Q = 2x_2x_3 + 2x_3x_1 + 2x_1x_2$  to canonical form.

Or

- (b) An elastic membrane in the  $x_1x_2$ -plane with boundary circle  $x_1^2 + x_2^2 = 1$  is stretched so that a point  $P = (x_1, x_2)$  goes over a point  $Q = (y_1, y_2)$  given by  $y_1 = 5x_1 + 3x_2$  and  $y_2 = 3x_1 + 5x_2$ . Find the principal directions that is, the directions of the position vector  $x$  of  $P$  for which the direction of the position vector  $y$  of  $Q$  is the same or exactly opposite. What shape does the boundary circle take under this deformation?

12. (a) (i) Find  $y''$  if  $x^4 + y^4 = 16$ . (8)

- (ii) Differentiate  $y = (2x+1)^5 (x^3 - x + 1)^4$ . (8)

Or

- (b) Find the intervals on which  $f(x) = -x^3 + 12x + 5$ ;  $-3 \leq x \leq 3$  is increasing and decreasing. Where does the function assume extreme values? What are those values?



13. (a) Find the maximum and minimum values of the function  $f(x, y) = 3x + 4y$  on the circle  $x^2 + y^2 = 1$ .

Or

- (b) Find the Taylor series expansion of the function  $f(x, y) = \sin x \sin y$  near the origin.

14. (a) (i) Evaluate  $\int_0^{\infty} e^{-ax} \sin bx dx$ , for  $a > 0$ . (8)

(ii) Integrate  $\int_0^{\pi/2} \frac{\sin x \cos x}{\cos^2 x + 3 \cos x + 2} dx$ . (8)

Or

(b) (i) Evaluate  $\int \frac{3x^4 + 3x^3 - 5x^2 + x - 1}{x^2 + x - 2} dx$ . (8)

(ii) Integrate  $\int x\sqrt{1+x-x^2} dx$ . (8)

15. (a) (i) Change the order of integration in  $\int_0^1 \int_{x^2}^{2-x} xy dy dx$  and hence evaluate. (8)

(ii) Find the area of the region inside the cardioid  $r = a(1 + \cos \theta)$  and outside the circle  $r = a$ . (8)

Or

(b) Find the volume of the region bounded by the paraboloid  $z = x^2 + y^2$  and the plane  $z = 4$ . (16)



Reg. No. :

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## Question Paper Code : 70175

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Civil Engineering

PH 3151 – ENGINEERING PHYSICS

(Common to All Branches)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A clock is mounted on the wall. What is the value of the angular acceleration of the second hand of the clock?
2. What are the differences between linear and nonlinear oscillations?
3. What is the physical meaning of Gauss law of magnetostatics?
4. A light pulse with a power of 100 mW has a duration of  $10^{-5}$  s. If it is absorbed completely by an object at rest. Find the final momentum of the object.
5. What are standing waves?
6. Why is population inversion necessary for lasing action?
7. What is Compton effect?
8. An electron trapped in a one dimensional infinite potential well has a ground-state energy of 1 eV. What is the width of the box?
9. Mention some differences between the classical and quantum harmonic oscillators.
10. State Bloch's theorem.



PART B — ( $5 \times 16 = 80$  marks)

11. (a) (i) Derive an expression for the moment of inertia for a hollow cylinder about its own axis and about an axis passing through the centre and perpendicular to its own axis. (12)
- (ii) The Earth has a mass of  $5.97 \times 10^{24}$  kg, and the Moon has a mass of  $7.36 \times 10^{22}$  kg. The center of the Moon is at a distance of 384,000 km from the center of Earth. Find the centre of mass of the earth-moon system from the centre of the earth. (4)

Or

- (b) (i) Discuss in detail the rotational energy states of a diatomic molecule. (12)
- (ii) A large disc is spun by applying a torque on the top edge. Assuming a force of 100 N is exerted through a rotation of 1 rad, find the final angular velocity and rotational kinetic energy. Given, the radius of the disc is 0.22 m and mass is 5kg. (4)
12. (a) Derive the wave equation for plane electromagnetic waves in vacuum from the Maxwell's equations.

Or

- (b) Discuss in detail the production of electromagnetic waves.
13. (a) (i) Explain the energy transfer of a wave. (12)
- (ii) A vehicle has bad suspension system and undergoes oscillations when crossing over a bump. Calculate the frequency and period of oscillations for the vehicle if its mass is 1 ton and the force constant of the suspension is  $2.69 \times 10^4$  N/m. (4)

Or

- (b) (i) Discuss the construction and working of a CO<sub>2</sub> laser with suitable diagrams. (12)
- (ii) A point light source 5 m below the surface of a water pool produces a circular pattern of light when viewed from above. Taking the refractive index of water to be 1.33, find the radius of the circle. (4)

14. (a) (i) Obtain the Schrodinger's time independent and time dependent equations for the one dimensional case. (12)  
(ii) What is the physical significance of a wave function? (4)

Or

- (b) (i) Derive an expression for the wave function and energy of a particle trapped in a one dimensional infinite potential well. (12)  
(ii) What do you understand from the correspondence principle? (4)
15. (a) Describe the construction and working of scanning tunneling microscope with suitable diagrams.

Or

- (b) Describe the dynamics of a fundamental particle trapped in a one dimensional well of finite potential.
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