Regd. No. | 2 | 3 | 1 | F | A | 0 | 1 | 0 | 1 | 8 |

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
-Estd. u/s 3 of UGC Act 1956

Regulation: R22 **Code No: 22MT101/5**

I B. Tech I Semester Regular Examinations - December, 2023

ELEMENTARY MATHEMATICS

Time: 150 Min (BI/BIOTECH/BME/FT) **Max. Marks:80M**

SECTION – A

Answer all Four questions **4×10M=40M**

1. a) Consider a sequence where the odd-numbered terms form an arithmetic progression, and the even-numbered terms form a geometric progression. If the first term is 3 and the common difference and ratio are 2 and 4, respectively, find the 6th term.

   b) A ladder has rungs 25 cm apart. The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top. If the top and the bottom rungs are 2 and 1/2m apart, what is the length of the wood required for the rungs?

   c) Model a scenario where the value of an investment grows exponentially over time due to compound interest.

2. a) Decompose the function $\frac{x^2+1}{x(x^2+x+1)}$ into partial fractions.

   b) Investigate the properties of the decomposed terms, especially when x is restricted to certain intervals.

   c) How do you handle quadratic factors in the denominator when decomposing a rational function into partial fractions?

3. a) How does the derivative of a constant function behave?

   b) Can you analyze the derivative of the function $\frac{x \sin x}{\sin x + \cos x}$. If yes, then find the derivative of that function with respect to x.

   c) The population of a species is modeled by the function $P(t) = 500e^{0.02t}$ where t is the time in years? Find the rate at which the population is growing after 3 years.

4. a) If you multiply the entire equation of a line by a constant, how does it affect the line?

   b) A person standing at the junction (crossing) of two straight paths represented by the equations $2x-3y+4 = 0$ and $3x+4y-5= 0$ wants to reach the path whose equation is $6x-7y+8= 0$ in the least time. Find equation of the path that he should follow.

   c) Explain the role of straight lines and linear equations in medical imaging technologies such as CT scans or MRI scans.

SECTION - B

Answer all Two questions 2×20M=40M

5. a) Explain the reciprocal relationships between cosecant, secant, and cotangent.

   b) The angle of elevation of a jet fighter from point A on the ground is 60 degrees. After 15 seconds the angle of elevation changes from 60 degrees to 30 degrees. If the jet is flying at a speed of 720 km/hr, find the height at which the jet fighter is flying.

   c) Explore how trigonometry is employed in medical imaging techniques such as CT scans.

6. a) Apply integration to find the area under the curve$y = x^2$ from $x = 0$ to $x = 2$.

   b) Determine the partial fractions of the following functions, if possible; using those partial fractions integrate them. $\dfrac{2x+3}{(x+2)(x^2+4)}$

   c) How can integration concepts be creatively applied to model or understand natural phenomena, such as the growth of plants or the behaviour of animals?

Regd. No. 2 3 1 F A 0 1 0 1 8

Regd. No. 2 3 1 F A 0 1 0 1 8

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
-Estd. u/s 3 of UGC Act 1956

Regulation: R22 **Code No: 22EN104/5**

I B. Tech I Semester Regular Examinations - December, 2023

TECHNICAL ENGLISH COMMUNICATION

(BI/BIOTECH/BME/CHEM/CIVIL/CSE(CS)/CSE(DS)/CSE(AI&ML)/ECE/EEE/FT/MECH/R&A)

Time: 150 Min **Max. Marks:80M**

SECTION – A

Answer all Four questions **4×10M=40M**

1. (a) What is social media? List out at least four social media sites. (3M)
   (b) Evaluate the impact of social media on youth? (3M)
   (c) What are the advantages and disadvantages of social media? (4M)

2. (a) What is email etiquette? (3M)
   (b) Why is email etiquette important in day-to-day communication? (3M)
   (c) Write an email to your cousin inviting him/her to your university function, where you are going to receive an award. Give him/her some details about your award. (4M)

3. (a) What is a process description? (3M)
   (b) What should be included in a process description? (3M)
   (c) Read the instructions carefully for preparing Maggi noodles and write a well-built paragraph of about 120-150 words using the tips below. (4M)
   - Boil 500 ml water in a container.
   - Add noodles and taste makers.
   - Mix finely chopped vegetables.
   - Cook the noodles for only two minutes.
   - Finally, serve them hot.

4. (a) What are the features of a good paragraph? (3M)
   (b) Make six sentences using any of six transitional words. (3M)
   (c) Write a paragraph about a special childhood toy or memento. Describe why it is important to you and how it makes you feel. (4M)

SECTION - B

Answer all Two questions **2×20M=40M**

5. (a) What is note making and why is it important? (4M)
   (b) Mention any four techniques of summarizing. (4M)
   (c) Read the following passage carefully and make a note on it, using headings and sub-headings by giving an appropriate title. Also prepare the summary of it. (6+6=12M)

Throw out the bottles and boxes of drugs in your house. A new theory suggests that medicine could be bad for your health, which should at least come as good news to people who cannot afford to buy expensive medicine. However, it is a blow to the medicine industry, and an even bigger blow to our confidence in the progress of science. This new theory argues that healing is at our fingertips: we can be healthy by doing Reiki on a regular basis.

Supporters of medical treatment argue that medicine should be trusted since it is effective and scientifically proven. They say that there is no need for spiritual methods such as Reiki, Yoga, Tai Chi. These waste our time, something which is quite precious in our material world. There is medicine that can kill our pain, x-rays that show us our fractured bones or MRI that scans our

brain for tumours. We must admit that these methods are very effective in the examples that they provide. However, there are some "every day complaints" such as back pains, headaches, insomnia, which are treated currently with medicine. When you have a headache, you take an Aspirin, or Vermidon, when you cannot sleep, you take Xanax without thinking of the side effects of these. When you use these pills for a long period, you become addicted to them; you cannot sleep without them. We pay huge amounts of money and become addicted instead of getting better. How about a safer and more economical way of healing? When doing Reiki to yourself, you do not need anything except your energy so it is very economical. As for its history, it was discovered in Japan in the early 1900s and its popularity has spread particularly throughout America and Western Europe. In quantum physics, energy is recognized as the fundamental substance of which the universe is composed. Reiki depends on the energy within our bodies. It is a simple and effective way of restoring the energy flow. There are no side effects and it is scientifically explained.

Opponents of alternative healing methods also claim that serious illnesses such as HIV/AIDS and cancer cannot be treated without drugs. They think so because these patients spend the rest of their lives in the hospital taking medicine. How can Reiki make these people healthy again? It is very unfortunate that these patients have to live in the hospital losing their hair because of chemotherapy, losing weight because of the side effects of the medicine they take. Actually, it is common knowledge that except for when the cancer is diagnosed at an early stage, drugs also cannot treat AIDS or cancer. Most of the medicine these patients use is to ease their pain and their sufferings because of the medical treatment they undergo. Instead of drugs which are expensive and have many side effects, you can use your energy to overcome the hardships of life, find an emotional balance, leave the stress of everyday life and let go of the everyday worries. Most of the chronic conditions such as eczema or migraine are known to have causes such as poor diet and stress. Deep-rooted anger or other strong emotions can contribute to viral infections as well. Since balancing our emotions and controlling our thoughts are very important for our well-being, we should definitely start learning Reiki and avoid illnesses before it is too late.

Some people may still maintain that in our material world, everything depends on time. It is even "lacking time" that causes much of the stress that leads to the illnesses we mentioned. How would it be possible to find time to do Reiki to ourselves and the people around us when we cannot even find time to go to the theater? This is one good thing about Reiki; it does not require more than 15 minutes of our time. There is no need for changing clothes or special equipment. It is a wonderfully simple healing art, an effective method of relaxation and stress-relief. Most important of all, it is less time consuming than medicine if we think of all the time we spend taking medicine for some complaints and taking some more for the side effects as well.

Having said these, resistance to Reiki would be quite illogical. Reiki is natural and drug-free. What is more, it is easy to learn by anyone, regardless of age and experience. It can be used anywhere, anytime. It also enhances physical, mental, emotional and spiritual well-being and the benefits last a lifetime. It is definitely high time to get away from the drug boxes we store in our drug cabinet!

6. (a) What is report writing? (4M)
   (b) What are the characteristics of a good report? (4M)
   (c) Your University celebrated 'Nutrition Week' from 1st September to 7th September by arranging inter-college cookery contests, oratorical, painting and poster competitions, besides talks by eminent nutritionists and medical professionals. There was an overwhelming response from students and parents. Prepare a report in 150-200 words to be published in your university magazine. You are Arjun/Anita, Student Activity Council member. (12M)

Regd. No. 2 3 1 F A 0 1 0 1 8

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
Estd. u/s 3 of UGC Act 1956

Regulation: R22 **Code No: 22TP103/7**

I B. Tech I Semester Regular Examinations - December, 2023

PROGRAMMING IN C

(BI/BIOTECH/BME/CHEM/CIVIL/CSE/CSE(CS)/CSE(DS)/CSE(AI&ML)/ECE/EEE/FT/IT/MECH/R&A)

Time: 150 Min **Max. Marks:80M**

SECTION – A

Answer all Four questions **4×10M=40M**

1.
   a) Why we prefer 'for' loops over 'while' loops? (4M)
   b) Read a two-digit integer such that the digits are in increasing order. Make it a three-digit number by adding a digit at the end so that the resulting number has all its digits in the increasing order from left to right. Design a suitable logic to perform this task (3M)
   c) Given two strings s2 and s1, return the index of the first occurrence of s2 in s1, or -1 if s2 is not part of s1. if s1 = "sadbutsad", s2 = "sad", then the output is 0. (That is "sad" occurs at index 0 and 6). (3M)

2.
   a) Write the syntax of goto statement. Give an example. (4M)
   b) Given an integer array '*nums*' sorted in non-decreasing order, return an array of the squares of each number sorted in non-decreasing order. For example, if nums=[-4,-1,0,3,10], then the output is [0,1,9,16,100]. Design a code snippet to return the array squares in sorted in non-decreasing order. (3M)
   c) Given an array of integers '*nums*', calculate the pivot index of this array. The pivot index is the index where the sum of all the numbers strictly to the left of the index is equal to the sum of all the numbers strictly to the index's right. Find the leftmost pivot index. If no such index exists, return -1. Create a code snippet to find the pivot index. (3M)

3.
   a) What is the purpose a return statement? Can we have any number of return statements in a function? (4M)
   b) Given a string s, find the first non-repeating character in it and return its index. If it does not exist, return -1. For example, if s = "lovecode" is the input string, then the output is 0. Design logic to perform this task. (3M)
   c) Given an array of positive integers 'nums', return the number of distinct prime factors in the product of the elements of 'nums'. For example, if Input: nums = [2,4,3,7,10,6], the output is 4. That is,the product of all the elements in nums is: $2 * 4 * 3 * 7 * 10 * 6 = 10080 = 2^5 * 3^2 * 5 * 7$.
   There are 4 distinct prime factors so we return 4. Create a function to perform this task. (3M)

4.
   a) Write the syntax of switch statement. Give an example. (4M)
   b) Design a function with the help of a switch statement the converts a number into its word form. For example, 345 is converted into "three four five". (3M)

c) Your task is to convert an integer into its words equivalent. For example 123 is converted into its word equivalent as "one hundred twenty three". Create a code snippet to convert the integer into its word equivalent. (3M)

SECTION - B

Answer all Two questions **2×20M=40M**

5.

a) Write the syntax of a one dimensional array. Give an example where a 1-D array of integers is created and displayed.

b) Given two integer arrays arr1 and arr2 sorted in strictly increasing order, return a sorted array of only the integers that is 'common' in all three arrays. For Example arr1 = [1,2,3,4,5], arr2 = [1,2,5,7,9]. Then the output is [1,5]. Create a function that performs this task.

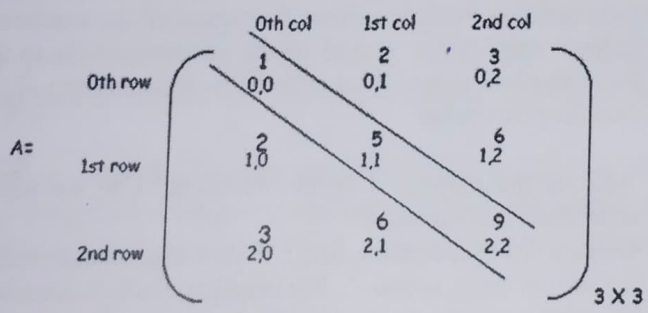
c) Given a single digit integer '*num*' from 0-9, check whether that digit is present in a string s containing the word form in the shuffled order. If it is present then print 'true' else 'false'.
Example :
Input: num=5, s="ifev"
Output: true.

d) Given a string num that contains only digits and an integer target, return all possibilities to insert the binary operators '+', '-', and/or '*' between the digits of num so that the resultant expression evaluates to the target value.
Note that operands in the returned expressions should not contain leading zeros.
For example, if Input: num = "232", target = 8, the Output: ["2*3+2","2+3*2"]

6.

a) What is a call-by-value function? Give an example.

b) The trace of a square matrix is found by summing the elements on the principal diagonal. Design a suitable logic and implement it in C.



Trace of the matrix is 1+5+9=15

c) Read an m x n matrix and find the row sums and column sums. Check whether any two rows have the same sum; if so swap the elements of these two rows.

d) A perfect number is a positive integer that is equal to the sum of its proper divisors. Create an array of perfect numbers from 1 to 10000. Find the number of prime factors of every perfect number in the array. Rank them based on the number of prime factors they have. That is, sort the array of perfect numbers based on the number of prime factors each number has, the number having the highest number of prime factors is the first in the list.

Regd. No. 2 3 1 F A 0 1 0 1 8

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be University)
-Estd. u/s 3 of UGC Act 1956

Regulation: R22 **Code No: 22PY101/5**

I B. Tech I Semester Regular Examinations – December, 2023

APPLIED PHYSICS

(BI/BIO-TECH/BME/FT)

Time: 150 Min **Max. Marks:80M**

SECTION – A

Answer all Four questions **4×10M=40M**

1. a) How is the acceptance angle defined in optical systems, and what is its significance in light propagation?
   b) How does the refractive index profile vary across the core and cladding of a step-index optical fiber, and what is the significance of this design?
   c) Find the numerical aperture of an optical fibre having a core refractive index of 1.55 and a cladding refractive index 1.50?

2. a) How do you determine the Miller Indices for a plane in a crystal lattice?
   b) How can you find the distance between two parallel crystal planes given their Miller Indices?
   c) In crystallography, how would you identify and describe the orientation of the (110) and (011) crystallographic planes within a given crystal lattice and what are their characteristics in terms of their orientation with respect to the crystallographic axes?

3. a) How does double refraction differ from regular refraction? How would you predict the behavior of light passing through a birefringent crystal in terms of double refraction?
   b) Describe the phenomenon of birefringence in Nicol prisms and how it influences the behavior of light as it passes through the crystal?
   c) How can you use a Nicol prism to demonstrate the phenomenon of optical rotation?

4. a) What are the primary differences between SEM and optical microscopes in terms of imaging and resolution?
   b) Explain the principles of electron beam-sample interaction that result in the formation of SEM images.
   c) Describe how energy dispersive X-ray spectroscopy (EDS or EDX) works in conjunction with SEM for elemental analysis.

Regulation: R22 Code No: 22PY101/5

SECTION-B

Answer all Two questions 2×20M=40M

5. a) What is ball milling, and how does it work as a mechanical processing technique for materials? How does the choice of ball milling parameters, such as ball size and milling time, affect the final properties of the milled materials?
   b) What is the sol-gel process, and how does it enable the synthesis of materials through chemical transformation of precursor sols?
   c) Describe the role of hydrolysis and condensation reactions in the sol-gel process and how they impact material formation.
   d) Explain the role of heat treatment or calcination in transforming gels into solid materials and the effects on their properties.

6. a) Compare and contrast spontaneous emission and stimulated emission within the context of laser light generation, elucidating the key differences between these two processes.
   b) Explain the fundamental principle that underlies the functioning of a He-Ne laser, emphasizing the key concept behind its operation.
   c) Compare the emitted light wavelength of a He-Ne laser with that of semiconductor diode lasers, highlighting the differences in their optical outputs.
   d) A helium-neon laser emits light with a wavelength of 632.8 nanometers (nm). Calculate the frequency and energy of a photon emitted by this laser.