

(b) What is a structure? Is nested structure possible? What will happen when the following code is executed? What changes are required in the following code if there are 50 persons. (8)

```
struct Person {
    } person1, person2, p[20];
```

OR

- Q7 (a) Explain the usage of typedef and enumerations with appropriate examples. (5)  
 (b) Write a program in C to show the basic declaration of pointer. (5)  
 (c) Create a structure called 'Student' in C that can store name of a student, his age, his marks, and date of birth. Then write a program to store data of 100 students using this structure called 'Student'. (5)

UNIT-IV

- Q8 (a) What do you mean by Linear and Binary Search? Given an array of integers nums that is sorted in ascending order, and an integer target, write a function to search target in nums. If target exists, then return its index. Otherwise, return -1. (7)  
 (b) Write a program to find factorial of a number in C: (8)

- (i) using for loop
- (ii) using function
- (iii) using pointers
- (iv) using while loop

OR

- Q9 (a) What are standard libraries in C language? What are their advantages? Explain the function of the following: (6)

- (i) stdio.h
- (ii) time.h
- (iii) math.h
- (iv) assert.h

(b) What is Insertion sort. Write a C program for insertion sort to arrange numbers of an array in ascending order. Also write another program that will arrange numbers in descending order. What is the best case, average case and the worst case complexity of insertion sort? (6)  
 (c) What is the output of the following program: (3)

```
#include <stdio.h>
int main()
{
    int a=10, b=20, *p, s=0;
    p = &a;
    a++;
    (*p)++;
    s = a + b + *p;
    printf("%d\n", s);
    return 0;
}
```

\*\*\*\*\*

ES-101

NS 10  
 2  
 2

END TERM EXAMINATION

FIRST SEMESTER [B Tech] MARCH 2023

Paper Code: ES-101

Time: 3 Hours

Subject: Programming in 'C'

Maximum Marks: 75

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit. Scientific calculators are allowed.

- Q1 Attempt the following questions: (2.5x6=15)

(a) Write a program in C to store elements in an array and print it.

(b) What is a generic pointer. What is the size of a generic pointer for a system of 16-bits, 32 bits and 64-bits?

(c) What is structure in C. How is it different from a Union. Explain with example how to create a structure and Union in C.

(d) What is recursion? How is it different from iteration? Explain with the help of an example.

(e) Find the output of the following program:

```
#include <stdio.h>
int main() {
    int var1 = 9, var2 = 9;
    printf("%d\n", var1++);
    printf("%d\n", ++var2);
    return 0;
}
```

(f) What is file data structure? Give the syntax to open a file in C. What does the value of mode - 'r', 'w' and 'a' represent. Write the syntax for reading or writing a character in a file. What is returned if file does not get opened.

UNIT-1

- Q2 (a) What would be the output obtained from the following four programs (8)

(i) #include<stdio.h>

```
int main()
{
    int p, q, r;
    p = 8 > 5 > 2;
    q = 8 > 5 > 0;
    r = 8 > 5 > 1;
    printf("%d %d %d", p, q, r);
    return 0;
}
```

(ii) #include <stdio.h>

```
main() {
    int p = 21;
    int q = 10;
    int z;
    z = p + q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p - q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p * q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p / q;
}
```

```
main() {
    int p = 21;
    int q = 10;
    int z;
    z = p + q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p - q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p * q;
    printf("Line 1 - Value of z is %d\n", z);
    z = p / q;
}
```

ES-101  
P1/4

```
printf("Line 1 - Value of z is %d\n", z);
z = p % q;
printf("Line 1 - Value of z is %d\n", z);
z = p++;
printf("Line 1 - Value of z is %d\n", z);
z = p--;
printf("Line 1 - Value of z is %d\n", z);
}
```

(iii) #include <stdio.h>

```
int main()
{
    int x;
    x = 10;
    if(x > 10)
        x = 10;
    else if(x >= 0)
        x += 00;
    else if(x)
        x += 10;
    else
        x = 10;
}
```

```
(iv) printf("%d\n", x);
return 0;
}
#include <stdio.h>
int main()
{
    unsigned char a=0xFF;
    a = (a>>4) | (a<<4);
    printf("a = %02X\n", a);
    return 0;
}
```

(b) Explain with the help of an example the differences between: (7)

- (i) arithmetic, relational and logical operators.
- (ii) compiler, linker and preprocessor

OR

- (a) Write down the basic structure of a C program? What is the process of compiling and running a C program. What are C tokens? What is the difference between constant and a variable. (8)
- (b) What is an operand? What is an operator? Write a program in C for the following: (7)
  - (i) if A is greater than 50, 0 is returned else 1 is returned.
  - (ii) To return the number of bytes occupied by the operand which is integer.

**UNIT-II**

- Q4 (a) What is a string? What is the difference between a character array and a string? Write a program in C to demonstrate the following operations: (10)
- (i) declare a string
  - (ii) different ways in which a string can be initialized
  - (iii) read a string
  - (iv) print a string
- Please give proper comments in your program.

P.T.O.

ES-101  
P 2/4

(b) What is the output of the following two programs in C: (5)

```
(i) #include <stdio.h>
#include <string.h>
int main()
{
    char str[20] = "ABCDEFGHIJK";
    int s = strlen(str);
    str[3] = '\0';
    s += strlen(str);
    strcpy(str, "ABCDEF");
    s += strlen(str);
    strcat(str, "ABC");
    s += strlen(str);
    printf("%d\n", s);
    return 0;
}
```

```
(ii) #include <stdio.h>
int main()
{
    unsigned char a=0xFF;
    char loop;
    for(loop=7; loop>=0; loop--)
        printf("%d ", (a & (1<<loop)) ? 1:0);
    printf("\n");
    return 0;
}
```

Q5 (a) What is the difference between: (8)

- (i) for and while loop
  - (ii) call by value and call by reference
- (b) Define array. How do we access elements in an array? Write at least four characteristics of an array. Write one scenario where you will use one dimensional array. Write another scenario where you will use multi-dimensional array. (7)

**UNIT-III**

- Q6 (a) Write a program in C to demonstrate the use of & (address of) and \*(value at address) operator. What is the output of following program? (7)
- ```
#include <stdio.h>
void sun(int *ptr)
{
    *ptr = 50;
}
```

```
int main()
{
    int y = 20;
    sun(&y);
    printf("%d", y);
    return 0;
}
```

P.T.O.

ES-101  
P 3/4

This unit contains 2 questions. Attempt any 1 question.

## UNIT-IV

(15)

- Q8 (a) Explain the role of enzymes as biocatalysts. (3)  
 (b) What are zero-, one-, two- and three- dimensional nanostructures. Explain with examples. (3)  
 (c) Write short notes on the following methods of synthesis of nanoparticles. (any three):- (3)  
 (i) sol-gel method  
 (ii) milling method  
 (iii) hydrothermal method  
 (iv) chemical reduction method  
 (d) Highlight the applications of nanomaterials in:- (4)  
 (i) medicine  
 (ii) electronics  
 (e) What is biodiesel? What are its applications? (2)
- Q9 (a) Explain morphological, optical and size characterization methods for nanomaterials. (5)  
 (b) Explain fermentation process. Illustrate this process during cellular respiration. (5)  
 (c) What is Green Chemistry? Discuss the principles of Green chemistry with suitable examples. (5)

\*\*\*\*\*

(Please write your Exam Roll No.)

## END TERM EXAMINATION

FIRST SEMESTER (B.TECH) MARCH 2023

Exam Roll No. 06017711622

Paper Code: BS-103

Time: 3 Hours

Subject: Applied Chemistry

Maximum Marks: 75

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit.

Q1 Attempt any three parts:-

(15)

(Atomic masses of Na=23, Mg= 24, O=16, C = 12, Ca=40, Cl=35.5, S=32 a.m.u.)

- (a) (i) Distinguish between permanent and temporary hardness of water. How can temporary and permanent hardness of water be removed?  
 (ii) A sample of water is found to contain following analytical data in milligrams per litre  $Mg/HCO_3/2 = 14.6$ ,  $MgCl_2 = 9.5$ ,  $MgSO_4 = 6.0$ ,  $Ca/HCO_3/2 = 16.2$  and  $NaCl = 5.0$ . Calculate temporary, permanent and total hardness of water in parts per million (ppm) and Degree French. (2+3=5)
- (b) (i) Discuss the mechanism of free radical and cationic polymerization using a suitable example.  
 (ii) Explain the mechanisms of lubrication. (2+3=5)
- (c) (i) Explain Lambert-Beer's Law. The absorption coefficient of a glycogen-iodine complex is 0.20 at light of 450 nm. What is the concentration when the transmission is 40 % in a cuvette of 2 cm?  
 (ii) Depict the molecular vibrations of water molecule. (3+2=5)
- (d) (i) Explain two approaches for the synthesis of nanoparticles.  
 (ii) 1-chlorohexane can be prepared by the following substitution reaction:  

$$CH_3(CH_2)_4CH_2OH + SOCl_2 \longrightarrow CH_3(CH_2)_4CH_2Cl + SO_2 + HCl$$
  
 Calculate the % atom economy for the synthesis of 1-chlorohexane. (3+2=5)
- (e) (i) Derive and explain Kirchhoff's equation.  
 (ii) The enthalpy of reaction ( $\Delta H_f$ ) for the formation of ammonia according to the reaction:  

$$N_2 + 3H_2 \longrightarrow 2NH_3; \text{ at } 27^\circ C \text{ is } \Delta H_f = -91.94 \text{ kJ}$$
  
 What will be the enthalpy of reaction at  $(\Delta H_f)$   $50^\circ C$ ? The molar heat capacities at constant pressure at  $27^\circ C$  for  $N_2$ ,  $H_2$  and  $NH_3$  are 28.45, 28.32 and 37.07 J, respectively. (2+3=5)

## UNIT-1

This unit contains 2 questions. Attempt any 1 question.

(15)

- Q2 (a) Define calorific value of a fuel. Differentiate between gross and net calorific value. (2)  
 (b) On burning 0.96 g of a fuel in a bomb calorimeter, the temperature of 4400 g of water increased from  $25.1^\circ C$  to  $29.7^\circ C$ , water equivalent of calorimeter and latent heat of steam are 484 and 587 cal/g, respectively. Fuel contains 0.9% H, calculate gross calorific value and net calorific value. (3)

P.T.O.

- (e) Give the composition of:  
 (i) Natural gas  
 (ii) Producer gas  
 (iii) Water gas
- (f) Which of the above has the highest calorific value?  
 Explain the principle of bomb calorimeter. What are the correction factors taken into account while calculating the calorific values of a fuel using bomb calorimeter? (3)
- (g) A coal sample was analysed as follows: 3 g of coal was weighed in silica crucible. Upon heating for 1 hour at 110 °C, the residue was weighed to be 2.956 g. The crucible was then covered with a lid and strongly heated at 1000 °C for 7 minutes. The residue was weighed to be 1.678 g. Then the crucible was heated without cover until a constant weight to 0.345 g was obtained. From the above data, calculate the proximate analysis of coal. (4)
- Q3 (a) How are scales and sludge formed in boilers? What are their disadvantages? How can their formation be prevented? (5)  
 (b) Name the gases dissolved in water that causes corrosion. How they can be removed? (2)  
 (c) What is Desalination? How can it be achieved? (2)  
 (d) 1 g of  $\text{CaCO}_3$  was dissolved in dil. HCl and diluted to 500 mL of water. 50 mL of this solution required 27 mL of EDTA solution for the titration. 50 mL of a hard water sample required 20 mL of same EDTA solution for titration. Calculate the total hardness of a water of the given water sample. (3)  
 (e) What is alkalinity of water? What are the ions present in alkaline water? (2)

UNIT-II

This unit contains 2 questions. Attempt any 1 question. (15)

- Q4 (a) What is meant by Eutectic Point? Explain the phase diagram of a two-component Pb-Ag system. (5)  
 (b) How many degrees of freedom are there for the following systems: (4)  
 (i) Water (l)  $\rightarrow$  Water vapour (g)  
 (ii) Ice (s)  $\rightarrow$  Water (l)  $\rightarrow$  Water vapour (g)  
 (iii)  $\text{CaCO}_3$  (s)  $\rightarrow$   $\text{CaO}$  (s) +  $\text{CO}_2$  (g)  
 (iv) S (rhombic)  $\rightarrow$  S (monoclinic)
- (c) An alloy AB contains 40% A in 1 kg. AB on cooling forms eutectic containing 60% A and 40% B and the rest of B. What is the amount of B formed during eutectic formation? (3)  
 (d) What are lubricating emulsions? Explain with examples. (3)

- Q5 (a) A polymer has been found to possess the population of various molecules as follows: (5)  
 (i) 5 molecules of molecular mass each 25000.  
 (ii) 15 molecules of molecular mass each 20000.  
 (iii) 10 molecules of molecular mass each 45000.  
 (iv) 25 molecules of molecular mass each 62000.  
 (v) 10 molecules of molecular mass each 100000.  
 Calculate its Number Average Molecular weight, Weight Average Molecular weight and P.D.I. Explain the significance of PDI. (5)

P.T.O.

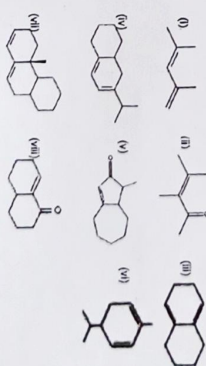
85-103  
p 2/11

- (b) How would you prepare Nylon-6 from cyclohexane? (2)  
 (c) Write the names and structures of the monomers for (i) Neoprene (ii) Teflon. Also mention their important applications of the above two polymers. (3)  
 (d) Write short notes on (any two):- (3)  
 (i) Adhesives  
 (ii) Polymer composites  
 (iii) Thermoset and Thermoplastic polymers

This unit contains 2 questions. Attempt any 1 question. (15)

UNIT-III

- Q6 (a) Explain the following terms (any three):- (3)  
 (i) Chromophores  
 (ii) Auxochromes  
 (iii) Bathochromic shift  
 (iv) Hypsochromic shift
- (b) Suggest the number of  $^1\text{H}$  NMR signals, their positions with respect to Tetramethylsilane and splitting patterns in the following molecules: (3)  
 (i)  $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{Cl}$   
 (ii) Isobutanol  
 (iii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
- (c) Using Woodward-Fieser's rule, calculate wavelengths of maximum UV absorption for following compounds: (any five):- (5)



- (d) How will you distinguish between the following groups using IR spectroscopy? (4)  
 (i) carboxylic (-COOH) and alcoholic (-OH) group  
 (ii) aldehyde (-CHO) and ketone (-CO-) group  
 (iii) amide (-CONH<sub>2</sub>) and amine (-NH<sub>2</sub>) group
- (a) Derive and explain Gibbs's Helmholtz equation. (2)  
 (b) What are Maxwell's relations? Explain. (3)  
 (c) Comment on following statements: (4)  
 (i) Less energy is only required for a  $\pi \rightarrow \pi^*$  of 1,3-butadiene than similar transition in ethene.  
 (ii)  $\lambda_{\text{max}}$  for methyl chloride is 173 nm and that of methyl iodide is 258 nm
- (d) What is Hooke's law in IR spectroscopy? Calculate the approximate frequency of the C-H stretching from the following data:  $K = 500 \text{ Nm}^{-1}$ , mass of carbon atom =  $20 \times 10^{-24} \text{ g}$ , mass of hydrogen atom =  $1.6 \times 10^{-24} \text{ g}$ . (3)  
 (e) Explain the principle of Raman spectroscopy and what are its applications? (3)

P.T.O.

85-103  
p 3/11

# END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: BS-105

Subject: Applied Physics-I

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory.  
Select one questions from each unit. Assume missing data, if any.

- Q1. Answer the following questions:- [3x5=15]
- (a) Explain briefly the negative results of Michelson-Morley Experiment?
  - (b) Give conditions of sustained interference.
  - (c) Explain continuum Model.
  - (d) Show that acceleration is invariant under Galilean Transformation.
  - (e) Define Poynting vector.

## UNIT-I

- Q2. (a) State and Explain the Second law of thermodynamics. Also give the limitations of first law of thermodynamics. [6+2=8]
- (b) Explain Adiabatic process by using first law of thermodynamics. [4]
- (c) What is thermal Equilibrium? Explain with example. [3]
- Q3. (a) Define thermodynamic variables and its types. Also give examples of each. [5]
- (b) Define Entropy .Explain entropy in a Reversible and irreversible process. [10]

## UNIT-II

- Q4. (a) State and derive Maxwell 3<sup>rd</sup> Equation in differential and integral form. Also write its significance. [8+2=10]
- (b) Derive Energy in SHM. Also give graphical representation of it. [5]
- Q5. (a) What is physical meaning of Poynting theorem .Give interpretation. [5]
- (b) Deduce the equation for propagation of electromagnetic wave in free space and obtain an expression for the velocity. Show that electric and magnetic field vectors are normal to each other and to the direction of propagation of waves. [10]

## UNIT-III

- Q6. (a) Define and derive the resolving power and dispersive power of a grating? [6]
- (b) In an experiment of Newton's rings, the diameter of 4<sup>th</sup> and 12<sup>th</sup> dark rings are 0.400cm and 0.700cm respectively. Calculate the diameter of 20<sup>th</sup> dark ring. [5]
- (c) Describe Fresnel's Biprism. [4]
- Q7. (a) Explain the phenomenon of Double refraction. Compare the properties of ordinary and extraordinary rays. [6]
- (b) Describe Nicol prism with neat diagram. [5]
- (c) In a grating spectrum, which spectral line in 4<sup>th</sup> order will overlap with 3<sup>rd</sup> order line of 5461 Å? [4]

P.T.O.

BS-105  
P1/2

**UNIT-IV**

- Q8. (a) What do you understand by the "Time dilation"? Discuss its Experimental proof. [5]  
(b) State fundamental Postulates of special theory of relativity. [5]  
(c) A rocketship is 50m long, when it is on flight its length appears to be 49.5m to an observer on the ground. Find the speed of the rocket. [5]
- Q9. - (a) What are Einstein's A and B co-efficients? Describe relation between them. [5]  
- (b) Draw the energy level diagram of He-Ne laser. How is it superior to a ruby laser? [5]  
- (c) Define coherence. Distinguish between spatial and temporal coherence. [5]

\*\*\*\*\*

**END TERM EXAMINATION**

FIRST SEMESTER [B. TECH.] MARCH 2023

Paper Code: ES-107

Subject: Electrical Science

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions including Q.No.1 which is compulsory.  
Select one question from each unit.

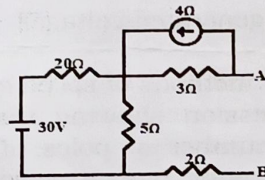
Q1 Attempt all:

(3×5=15)

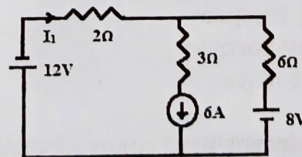
- a) Explain the terms complex power, apparent power, real power and reactive power.
- b) Show that power consumed in a pure capacitive circuit is zero when a sinusoidal AC voltage is applied.
- c) A coil has a resistance of  $25 \Omega$  at  $15^\circ\text{C}$ . If the temperature coefficient of resistance at  $15^\circ\text{C}$  is  $0.004/\text{K}$ , determine the resistance of the coil at  $80^\circ\text{C}$ .
- d) Explain different methods used for damping in measuring instrument.
- e) Explain the essential difference between cylindrical (smooth) and silent pole rotors used in large alternators.

**UNIT-I**

Q2 a) Find the thevenin's circuit across AB as shown in figure 1. (7)

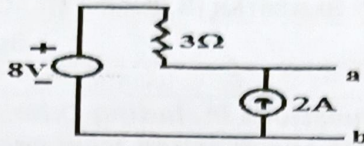


b) State and prove maximum power transfer theorem for dc networks. (8)

Q3 a) Determine the current  $I_1$  as shown in the figure (2) by the superposition theorem. (7)

b) Obtain the Thevenin equivalent across a-b for the network shown in figure (3). (8)

P.T.O.

**UNIT-II**

- Q4 a) A coil has an impedance of  $0.05 \text{ H}$  and a resistance of  $10 \Omega$ . It is connected to a sinusoidal  $200\text{V}$ ,  $50 \text{ Hz}$  supply. Calculate the impedance, current, power consumed and power factor. (8)
- b) Calculate the average and RMS value of a full rectified sine wave. (7)
- Q5 a) Show that the resonant frequency of a series RLC circuit is the geometric mean of the lower and upper cut-off frequency. (8)
- b) A single phase load of  $30\text{kW}$  at  $0.6$  power factor lagging is fed from  $200\text{V}$  a.c. supply. Calculate the  $\text{kVA}$  and  $\text{kVAR}$  of the load. (7)

**UNIT-III**

- Q6 a) Draw and explain the circuit diagram of different type of DC generator. (8)
- b) Why is rotating field system is used in preference to a stationary field? A 6-pole alternator rotates at  $1000 \text{ r.p.m.}$  What is the frequency of the generated voltage? (7)
- Q7 a) Discuss different methods of speed control of a DC motor. (8)
- b) Derive the expression showing the relationship between speed, frequency and number of poles of a synchronous machine. A waterwheel alternator has 20 poles. Calculate the speed for a frequency of  $50 \text{ Hz}$ . (7)

**UNIT-IV**

- Q8 a) Describe the operation of single phase transformer, explain clearly the function of the different parts. Why the cores are laminated (8)
- b) Explain the following in case of measuring instruments. (7)
- Deflecting torque
  - Controlling torque
  - Damping torque
- Q9 a) Describe short circuit and open circuit test in a transformer. (7)
- b) Describe with diagrams the construction and principle of operation of the permanent magnet moving-coil instrument, derive and expression for the torque. (8)

\*\*\*\*\*



# END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH- 2023

Paper Code: BS-109

Subject: Environmental Studies

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory.  
Select one question from each unit.

Q1 Attempt all:-

- (a) "Phosphorous is a part of the sedimentary biogeochemical cycle while oxygen is not." Justify the statement. (1)
- (b) Define mineral and mining. (3)
- (c) A sudden, uncontrollable descent of a mass of Earth down a mountain slope is known as .....? (1)
- (d) Coastal bays, river mouths, and tidal marshes constitute.....ecosystem. (1)
- (e) The main cause of genetic diversity is..... (1)
- (f) Which gases are responsible for global warming? (1)
- (g) Explain the concept of sustainable development. (1)
- (h) "Public awareness leads to environmental protection." Justify this statement. (2)
- (i) List four effects of acid rain on environment. (3)
- (j) Define biopiracy. (1)

## UNIT-I

- Q2 (a) Define deforestation. What are its main causes? Suggest a few steps to prevent it. (1,2,2)
- (b) What are food chains and food webs? Describe the food web of a grassland ecosystem. Support your answer with a diagram. (4)
- (c) Briefly explain the pyramid of numbers of a forest ecosystem. (3)
- (d) Explain ecological succession. (3)
- Q3 (a) What is a biogeochemical cycle? Describe the carbon cycle diagrammatically. (1,2)
- (b) What is the difference between endangered and endemic species? (3)
- (c) Discuss any three threats to biodiversity. Suggest three combative methods to overcome such threats. (3,3)
- (d) What is in-situ and ex-situ conservation? (3)

## UNIT-II

- Q4 (a) Write a short notes on any four of the following:- (2.5x4=10)
- i. Radiation pollution
  - ii. Vermicomposting
  - iii. Biomedical waste
  - iv. Incineration
  - v. Soil erosion

P.T.O.

BS-109  
P/2

- (b) What are primary air pollutants? Give any three examples. (1,2)
- (c) Explain any two methods to control particulate matter in air. (2)

- Q5
- (a) Describe the process of wastewater treatment in detail. Draw a flow diagram to support your answer. (6,1)
  - (b) How is noise classified on the basis of source? (3)
  - (c) Suggest any five measures to control noise pollution. (5)

**UNIT-III**

- Q6
- (a) What are energy-related urban problems? How can we control them? (3)
  - (b) "Rainwater harvesting is an efficient tool of water conservation". Justify this statement. (4)
  - (c) What is waste-land reclamation? Explain with suitable examples. (4)
  - (d) Explain the effect of consumerism on the environment. (4)
- Q7
- (a) What do you mean by environmental ethics? What role do they play in reducing environmental hazards? (3)
  - (b) Write a short note on Environmental Protection Act (1986) and Wildlife Protection Act (1971). (2,2)
  - (c) Explain the five stages of the environmental impact assessment process. (5)
  - (d) "Nuclear energy is boon as well as bane for human civilization". Explain. (3)

**UNIT-IV**

- Q8
- (a) What are the major contributory factors to world population growth? (3)
  - (b) What is the difference between HIV and AIDS? How can we prevent HIV infection? (3)
  - (c) Discuss the role of IT in environment and human health. Give some practical examples. (4)
  - (d) Describe family welfare programme in detail. (5)
- Q9
- (a) Write short notes on following:- (3x2=6)
    - i. Value education and the environment
    - ii. Oral Rehydration
  - (b) "Women and child welfare are very important for a sustainable environment." Discuss. (4)
  - (c) What are the objectives of Universal Declaration of Human Rights by United Nations? (2)
  - (d) Define population ageing, birth rate and growth rate. (3)

\*\*\*\*\*

# END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: BS-111

Subject: Applied Mathematics-I

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt all questions:-

(a) If  $\int_0^1 x^m dx = \frac{1}{m+1}$ , then find the value of  $\int_0^1 x^m (\log x) dx$ . (2.5)

(b) If  $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ , then compute the value of  $\vec{F} \cdot \text{Curl}(\vec{F})$ . (2.5)

(c) Find the particular integral for the linear differential equation: (2.5)

$$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = \sin 3x.$$

(d) Determine the rank of the matrix  $A = \begin{bmatrix} 1 & 3 & 2 & 1 \\ 1 & 2 & 5 & 2 \\ 2 & 1 & 1 & 3 \end{bmatrix}$ . (2.5)

(e) Applying Gauss divergence theorem, find the value of  $\int_S \vec{F} \cdot \hat{n} ds$ , for  $\vec{F} = (x^2 - yz)\hat{i} + (y^2 - xz)\hat{j} + (z^2 - yx)\hat{k}$  and S is the cube  $0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1$ . (2.5)

(f) Find the stationary values of the function  $f(x, y) = x^3y^2(1 - x - y)$ . (2.5)

### UNIT-I

Q2 (a) If  $u = f(r)$  and  $x = r \cos(\theta), y = r \sin(\theta)$ , then prove that (7)

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$$

(b) Evaluate  $\int_0^a \frac{\log(1+ax)}{1+x^2} dx$  and hence show that  $\int_0^1 \frac{\log(1+x)}{1+x^2} dx = \frac{\pi}{8} \log 2$ . (8)

Q3 (a) Find the shortest and longest distances from the point  $(1, 2, -1)$  to the sphere  $x^2 + y^2 + z^2 = 24$ . (6)

(b) If  $u = x^2 - y^2, v = 2xy$  and  $x = r \cos(\theta), y = r \sin(\theta)$ , then find the Jacobian  $J = \frac{\partial(u,v)}{\partial(r,\theta)}$ . (4)

(c) If  $u = f(e^{y-z}, e^{z-x}, e^{x-y})$ , then prove that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ . (5)

### UNIT-II

Q4 (a) Solve the ordinary differential equation:  $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = \log x \sin(\log x)$ . (8)

(b) Prove that  $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ , where  $J_n(x)$  represents the Bessel function of first kind. (7)

Q5 (a) Let the electric equipotential lines (curves of constant potentials) between two concentric cylinders be given by  $x^2 + y^2 = c$ , where c is the constant. Find their orthogonal trajectories (known as curves of electric force). (4)

(b) Solve the ODE:  $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x$ , by variation of parameters. (6)

(c) Solve the ODE:  $2y dx + x(2 \log x - y) dy = 0$ , by choosing suitable method. (5)

P.T.O.

**UNIT-III**

Q6 (a) Test the consistency and solve the system of equations: (7)  
 $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4.$

(b) Verify Cayley - Hamilton Theorem for the matrix (8)

$A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ , and hence find  $A^{-1}$ .

Q7 (a) Check whether the vectors  $(2, 1, 1), (2, 0, -1), (4, 2, 1)$  are Linearly dependent or independent? (6)

(b) Reduce the quadratic form  $2xy + 2yz + 2zx$  into the canonical form and discuss its nature. (9)

**UNIT-IV**

Q8 (a) What is the directional derivative of  $\phi = xy^2 + yz^3$  at the point  $(2, -1, 1)$ , in the direction of the normal to the surface  $x \log z - y^2 = -4$  at  $(-1, 2, 1)$ . (7.5)

(b) Apply Stoke's Theorem to evaluate  $\int_C (y \, dx + z \, dy + x \, dz)$ , where C is the curve of intersection of  $x^2 + y^2 + z^2 = a^2$  and  $x + z = a$ . (7.5)

Q9 (a) Find the curvature and torsion of the Helix  $x = a \cos t, y = a \sin t, z = bt$ . (7.5)

(b) Prove that  $\text{div}(\text{grad } r^n) = \nabla^2(r^n) = n(n+1)r^{n-2}$ , where  $r = \sqrt{(x^2 + y^2 + z^2)}$ . (7.5)

\*\*\*\*\*

# END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH-2023

Paper Code: HS-113

Subject: Communications Skills

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory.  
Internal choice is indicated.

Q1 Answer any **three parts:**

(5×3=15)

a) Do as directed:

i) Sowmya didn't permit any indiscipline. (Change into affirmative.)

ii) I may call you later. (Make passive voice.)

iii) The shopkeeper said, "I cannot allow any discount". (Change to indirect.)

iv) I am getting late for my class. (Question tag)

v) Sahil hasn't attended the lecture yesterday. (Correct the sentence if required.)

b) Write short a note on 'Clarity and Courtesy' in Communication.

c) Write short a note on difference between Formal and Informal Communication.

d) Write short a note on 'Context of Communication'.

e) What is 'Memorandum'?

Q2 Describe are the important features of effective communication? (15)

Q3 Explain various barriers to Communication. (15)

Q4 Write a paragraph on the topic 'Importance of Practical Skill in Education'. (15)

Q5. Write your resume for the post of Engineer in Bharat Technologies Ltd., Nagpur. Imagine the relevant details. (15)

Q6 What are the important strategies of an effective Group-discussion? (15)

Q7 What are the essentials of Good Listening? How is Good Listening important for an effective Group-discussion? (15)

P.T.O.

HS-113  
P1/2

Q8

a)

Correct the following sentences (**any ten**):

(10)

- i. Rohit couldn't got back to the game after the injury.
- ii. His brother have never been interested in painting.
- iii. Let us call there teacher.
- iv. Hardworking people are been given important jobs.
- v. If Abhay wouldn't have completed the job in time, you couldn't have appreciated her.
- vi. The instructor persuade the student to work hard.
- vii. They have been playing here since four months.
- viii. Kanta has a exceptional personality.
- ix. Have I told you about my brother Shyam which is a priest?
- x. Please keep quite so that I may read this letter.
- xi. The shirt is good but I don't like it's colour.
- xii. You must thought of changing the old car now.

b) Fill in the blanks choosing from the suggested words (**any five**): (5)

- i. The children have been ... waiting for the results. (oftenly/patiently)
- ii. This sweater will be ... for me. (good enough/enough fine)
- iii. They went out ... the cold wind outside. (inspite/despise)
- iv. Food is better ... that in Delhi. (than/then)
- v. She wrote the draft ... a pencil. (by/with)
- vi. He was walking too fast. I could not ... with him. (keep forward/keep up)
- vii. Akhil was anxious ... the safety of his grandparents. (about/at)

\*\*\*\*\*

# END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH 2023

Paper Code: ES-119

Subject: Manufacturing Process

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions including Q.No.1 which is compulsory.  
Select one question from each unit.

- Q1
- a) What is Manufacturing? List out different manufacturing processes. [2]
  - b) What is the difference between pattern and casting? [2]
  - c) Explain the effect of polarity on penetration in DC arc welding. [2]
  - d) Explain the basic principle of resistance welding. [2]
  - e) What is the difference between open and closed die forging process? [2]
  - f) What is powder metallurgy? [2]
  - g) Define the term plastic. What are its characteristics? [2]
  - h) List out four types of patterns. [1]

## UNIT-I

- Q2
- a) Describe in detail about the importance of manufacturing towards technological and social economic development. [7]
  - b) Describe properties of materials: Hardness, elasticity and malleability. [3]
  - c) What are the desirable properties of molding sand? [5]
- Q3
- a) Why is it important to provide a means of venting gases from the mold cavity? [3]
  - b) Describe the process of centrifugal casting with neat sketch. What are the advantages? [7]
  - c) List out the defects in casting process. Explain any three with neat sketch. [5]

## UNIT-II

- Q4
- a) Describe the oxy-acetylene gas welding technique and give the applications. [7]
  - b) Explain the principle of submerged arc welding with the help of neat sketch. Discuss its applications. [8]
- Q5
- a) What are differences between TIG and MIG welding processes? [5]
  - b) List out the defects in welding process. Write causes and remedies of following welding defects: i) Spatter ii) Overlap iii) Undercut [7]
  - c) What is the difference between filler metal and flux materials? [3]

P.T.O.

UNIT-III

- Q6 a) What are the main characteristics of hot working as compared with cold working process? [3]  
b) Explain direct extrusion and indirect extrusion with neat sketch. [8]  
c) List out the defects in forging process. Explain any two with neat sketch. [4]
- Q7 a) Explain the following terms with neat sketch: [8]  
i) Punching ii) Blanking iii) Lancing iv) Notching  
b) Write a short notes on i) Stretch Forming operation and ii) Metal spinning. [7]

UNIT-IV

- Q8 Explain the powder metallurgy process with neat sketch: powder production, blending, compaction and sintering. [15]
- Q9 a) Describe different types of plastics. [3]  
b) Explain the following molding processes of plastics with neat sketch: [12]  
i) Injection molding ii) Film-blowing iii) Transfer molding

\*\*\*\*\*