

FACULTY OF ENGINEERING

**B.E. (Civil/EEE/EIE/CSE/CME) IV - Semester (AICTE) (Backlog) Examination,
March / April 2022**

Subject: Effective Technical Communication in English

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

- 1 What is the importance of Format and Jargon in Technical writing?
- 2 List a few types of Oral and written Technical Communication.
- 3 What are the benefits of adding a Timeline while preparing a business proposal?
- 4 What is E-mail etiquette?
- 5 (i) A feasibility report is prepared after approval of a project. (True/False)
(ii) Is Bibliography in a report?
- 6 How can an Operations Manual help to make an employee more accountable?
- 7 Write about the differences between subjective and objective writing.
- 8 What do you mean by Intonation and what is its importance in a presentation?
- 9 Why should you analyse your audience before making a presentation?
- 10 When do you use a bar chart? Give examples.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) Write a note on the primary features of technical writing.
(b) How is technical writing different from general writing?
- 12 (a) What are the different uses of formal letters? Outline the differences between formal and informal letters.
(b) Assume you are Vindu Verma, a student pursuing Master's degree at the Central University of Jharkhand. Write a letter of complaint to the Chief Warden of the campus regarding the deterioration of food quality served in the hostel mess resulting in ill health among the hostelites. Seek his intervention in this regard.
- 13 (a) What are the guidelines to be followed for drafting a business proposal?
(b) Draft an unsolicited business proposal to provide on-site child care services for a newly opened branch of a company viz. Scopematix at Gachibowli, Hyderabad.
- 14 (a) Discuss seven dos and don'ts to be followed while drafting a business e-mail.
(b) Prepare a feasibility report on starting a mobile bookstore business in the semi-urban areas of Hyderabad, especially in the pandemic situation.
- 15 (a) What is an operations manual? Write a note on the benefits of a well-crafted operations manual.
(b) Prepare a basic user manual of a smart phone. Sketch diagrams if necessary.

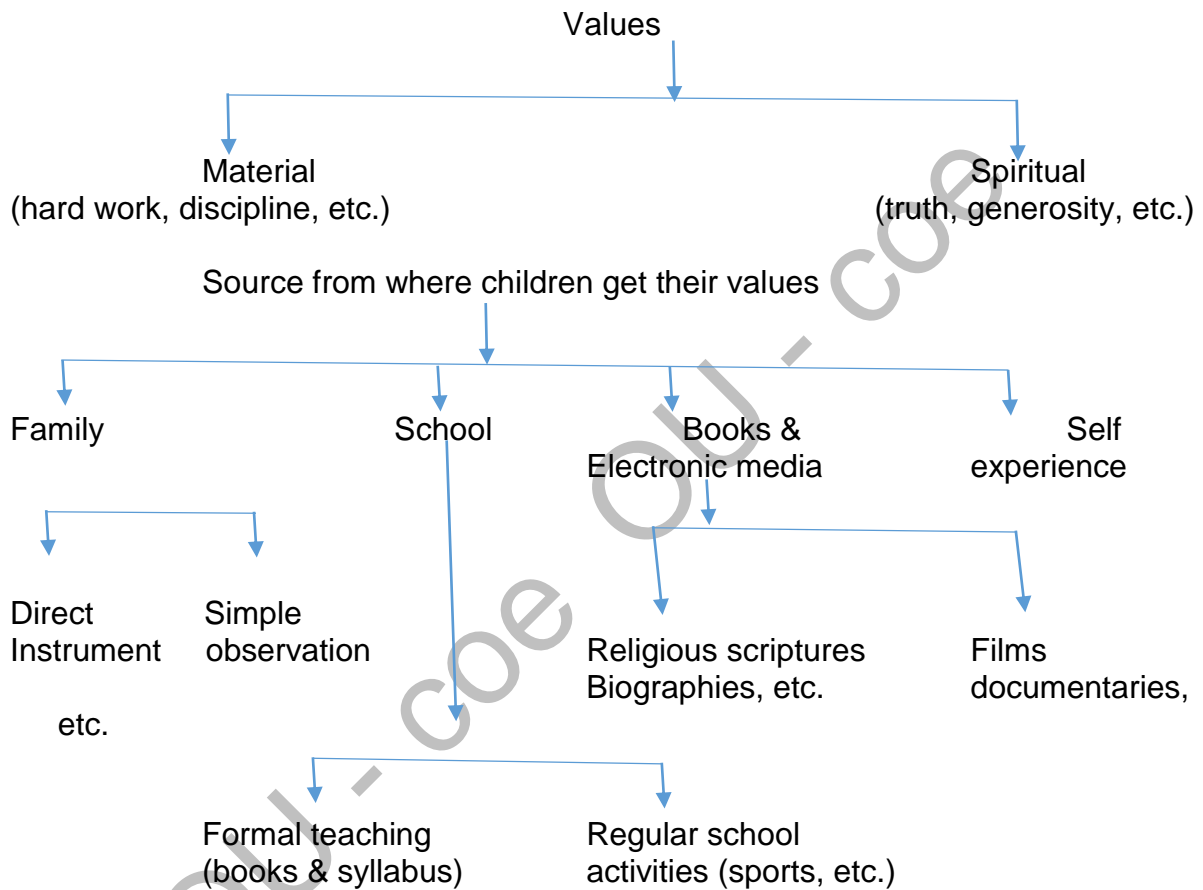
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16 (a) Discuss the use of any five visual elements for technical communication with relevant pictures.

(b) Write a note on the differences between verbal and non-verbal communication.

17 (a) Write brief notes on the importance of Body language in oral presentation.

(b) Write a meaningful paragraph based on the information given below.



FACULTY OF ENGINEERING

B.E. (ECE) IV - Semester (AICTE) (Backlog) Examination, March / April 2022

Subject: Human Values and Professional Ethics

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

1. Write a short note on the need for value education in today's scenario.
2. Values and skills complement each other. Elaborate.
3. Define self exploration.
4. Differentiate between prosperity and wealth with examples.
5. Enumerate some of the important values which lie at the base of good relationships.
6. Name the values which are called as "foundation value" and "complete value". Define both these values.
7. Explain 'activity completeness' (Kriyapurnata).
8. What is 'conduct completeness' (acharanpurnata)?
9. Write a short note on policy (niti) and highlight the need to adopt policies that are conducive to human welfare.
10. Discuss Humanistic Universal Order.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) Explain how production skills and human values are complementary. Give two examples.
(b) What is the meaning of prosperity? How can you say that you are prosperous?
- 12 (a) The needs of the body are quantitative. Illustrate.
(b) What is pre-conditioning? What is their source?
- 13 (a) How does fearlessness follow from right understanding and prosperity?
(b) What do you understand by trust? Differentiate between intention and competence with examples.
- 14 (a) Outline the four Orders of Nature.
(b) Differentiate between Units and Space.
- 15 (a) What is Ethical Competence? Why should it be developed?
(b) What is Right Understanding? Explain the transformation that brings about in human beings.
- 16 (a) Explain with examples the various activities in the self 'I'.
(b) What is the difference between respect and disrespect?
- 17 (a) What are the requirements to fulfill basic human aspirations?
(b) Elaborate on the statement, 'Professional Ethics imply the right utilization of one's professional skills towards the fulfillment of comprehensive human goal'.

FACULTY OF ENGINEERING
B.E. (ECE/MECH/PD/AE/IT) IV - Semester (AICTE) (BACKLOG) Examination,
March / April 2022
Subject: Biology for Engineers

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

- 1 Write the functions of proteins.
- 2 What are vitamins? Give the classification of vitamins.
- 3 Give the economic importance of microbes.
- 4 Explain the mechanism of nitrogen fixation.
- 5 What are the functions of circulatory system?
- 6 Give an account on evidences of evolution.
- 7 Describe the structure of chromosome.
- 8 How is influenza caused? What are the symptoms of influenza?
- 9 Illustrate the design of bioreactor.
- 10 What is bioenergy? Give the sources of bioenergy.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 Give a detailed account on structure, classification and functions of enzymes.
- 12 Describe the organization of respiratory system in animals.
- 13 Discuss the cell division in somatic and gametic cells.
- 14 Write an account on immunization.
- 15 What are biofilters? Discuss with examples and applications of biofilters.
- 16 Discuss the causes, symptoms, diagnosis, treatment and prevention of hypertension.
- 17 What is a transgenic animal? How it is produced? Give the applications of transgenic animals.

FACULTY OF ENGINEERING
B.E. II / IV (Civil/ECE/CSE/AE) II - Semester (NON-CBCS) (Backlog)
Examination, March / April 2022
Subject: Environmental Studies

Time: 3 hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

- 1 Discuss environmental affects of floods and drought.
- 2 Discuss the problems and benefits associated with dams.
- 3 Discuss the structure and functions of an ecosystem.
- 4 Explain ecological pyramid with examples.
- 5 State the benefits of biodiversity.
- 6 Define endangered species and give examples.
- 7 Write three causes of soil pollution.
- 8 Explain the issues involved in enforcement of environmental legislation.
- 9 Define watershed management.
- 10 Explain the types of disaster briefly.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) List the measures to be taken to prevent groundwater depletion.
(b) Write short notes on Land degradation, Soil erosion and Desertification.
- 12 (a) Explain the significance of food chains, food webs and food pyramids to maintain balanced ecosystem.
(b) Define the terms Producers, Consumers, decomposers and detritivores.
- 13 (a) Write in detailed notes on Biogeographical classification of India.
(b) Define biodiversity. Write short notes on values of Biodiversity.
- 14 (a) Write causes of air pollution, its effects and remedies.
(b) Write salient features of the Water (Prevention and control of Pollution) Act 1974.
- 15 (a) Write short notes on Water conservation and environmental ethics.
(b) Explain acid rain and Ozone layer depletion.
- 16 (a) Write the basic principles of disaster mitigation. Define Disaster Management.
(b) Explain Disaster Management cycle and impact of disaster on environment.
- 17 (a) Write about the growing energy needs of India.
(b) Differentiate renewable and nonrenewable sources of energy.

FACULTY OF ENGINEERING
BE II / IV (EEE) II – Semester (NON-CBCS) (Backlog) Examination,
March / April 2022
Subject: POWER SYSTEM – I

Time: 3 hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

1. How are nuclear reactor classified.
2. What is function of economizer?
3. List the various non - conventional energy sources.
4. Brief about characteristics of wind power.
5. Define load factor and diversity factor.
6. List the various methods to improve power factor.
7. What is the effect of ice and wind on sag?
8. List the advantages of suspension type insulator.
9. What are the advantages of bundle conductors.
10. What is the effect of earth on GMR and GMD capacitance?

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

11. a) What consideration have to be kept in view of in selecting hydal power plant.
b) Give complete classification of hydro electrical power plants.
12. a) Draw the typical layout of a gas turbine power plant and explain the main components.
b) Draw the typical diagram of pressurized water reactor and explain along with its advantages and disadvantages.
13. a) With necessary diagrams explain about solar concentrators.
b) How is solar energy converted into electrical energy? Explain the principle of operation.
14. a) Derive the expression for the most economical power factor that can be achieved by a consumer.
b) Explain the different types of tariffs.
15. a) Derive the expression for sag of a line supported between two supports of the same height.
b) What is the need of grading of cables? Explain capacitance grading.
16. a) Explain the improvement of string efficiency by using a Guard Ring ?
b) What are the factors governing the capacitance of a transmission line?
17. Answer any two of the following:
 - a) Prime movers used in Hydro electric power plants
 - b) Capacitance of three core cables
 - c) Disadvantages of low Power Factor

FACULTY OF ENGINEERING

**BE II / IV (EIE) II – Semester (NON-CBCS) (Backlog) Examination,
March / April 2022**

Subject: Thermodynamics and Fluid Mechanics

Time: 3 hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

1. State the first law of thermodynamics
2. Explain the concept of Internal energy and Enthalpy.
3. Why engines used in two wheelers are mostly two stroke engines?
4. Sketch Brayton Cycle on T-S plot.
5. State the merits of multi staging in reciprocating air compressors
6. Define Specific Weight and Specific Volume
7. Define Dynamic Viscosity of a fluid & state its SI and CGS units.
8. What is the applications of Bernoulli's equation in Venturimeter?
9. What is the significance of dimensional analysis.
10. What are the friction losses in pipes.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

11. a) Discuss about the significance of principle of increase in entropy.
b) Differentiate between two stroke and four stroke IC engines?
12. Discuss the classification of Gas turbines. Discuss about the various processes of Joule cycle on T-S and P-V plots.
13. A single stage, single acting air compressor delivers air at 5 bar. The suction temperature is 20°C and suction pressure is 1 bar volume of air entering the compressor is 3 m³/min. Index of compression is 1.2. Calculate power required to drive the compressor, where neglect clearance volume. Speed of Compressor is 350rpm.
14. Define equation of continuity. Obtain an expression of continuity of equation for a three – dimensional flow.
15. a) Derive Bernoulli's equation from Euler's equation. State assumptions made in the derivation.
b) Define Steady, Unsteady, Uniform and Non- uniform flows?
16. In a simple gas turbine cycle air enters the compressor at 1 bar, 27 °C and comes out 4.5 bar. The hot gases enter the turbine at 1100°C. Assume isentropic compression and expansion. Calculate i) Compressor work input ii) Turbine work output iii) Thermal efficiency iv) Specific fuel consumption. Assume mass flow rate of air. C.V of fuel is 43MJ/kg.
17. a) State and prove Clausius Inequality
b) Discuss the relative merits and demerits of venturimeter with respect to orificemeter.

FACULTY OF ENGINEERING
BE II / IV (MECH/PROD) II - Semester (NON-CBCS) (Backlog) Examination,
March / April 2022
Subject: Thermodynamics

Time: 3 hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

- 1 Define thermodynamic system and classify the different types with examples.
- 2 State the zeroth law of thermodynamics. What is its importance?
- 3 State the first law of thermodynamics.
- 4 Differentiate between heat and work.
- 5 State Kelvin-Planck and Clausius statements of Second Law of thermodynamics.
- 6 Define available energy and unavailable energy.
- 7 Explain the concept of anomalous expansion of water.
- 8 Define saturated steam (dry steam), wet steam and superheated steam.
- 9 Sketch the P-V and T-S diagrams for Diesel cycle.
- 10 Differentiate between volumetric analysis and gravimetric analysis.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) Differentiate between microscopic approach and macroscopic approach.
(b) Explain the construction and working of a constant volume gas thermometer.
- 12 (a) Derive the steady flow energy equation.
(b) A mass of gas is compressed in a quasi static process from 80 kPa, 0.1 m³ to 0.4 MPa, 0.03 m³. Assuming that the pressure and volume are related by $p v^n = \text{constant}$, find (i) n; (ii) Work done by the gas system.
- 13 (a) Explain the Carnot cycle and obtain an expression for its thermal efficiency.
(b) Define entropy. Derive an expression for change in entropy during the following process.
(i) Constant Volume process; (ii) Constant Pressure process.
(iii) Isothermal Process and (iv) Polytropic Process.
- 14 (a) Explain the formation of steam with suitable property diagrams.
(b) Find the saturation temperature, changes in specific volume and entropy during evaporation and the latent heat of vaporization of steam at 1 MPa.
- 15 (a) Discuss the air standard Otto cycle with P-V and T-S diagrams and obtain an expression for its thermal efficiency.
(b) Define and discuss mole fraction, mass fraction, Dalton's law of partial pressures and Amagat Deduc's Law of partial volumes as applied to gas mixtures.
- 16 (a) Derive the four Maxwell's relations.
(b) Explain the various scales of temperature.
- 17 Write short notes on the following:
(a) State, property, process and cycle
(b) Carnot theorems (any three)
(c) Rankine Cycle.

FACULTY OF ENGINEERING
B.E. II / IV (IT) II - Semester (NON-CBCS) (Backlog) Examination,
March / April 2022
Subject: Web Technologies

Time: 3 hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

- 1 What are the different types of CSS Selectors?
- 2 Define REST service.
- 3 What is XSLT Style Sheets?
- 4 Define JSP directives with example.
- 5 How to handle exceptions in JSP?
- 6 Explain the basic servlet structure.
- 7 Define Web Service.
- 8 Give structure of SOAP message.
- 9 Write about the UDDI data structure.
- 10 How to manage data using ASP.NET

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11.(a) Explain the CSS BOX model in detail.
(b) Write a program to implement event handling in JQuery.
12. Write DTD for the XML document for student details with the following fields (regno, stud_name, branch, email_Id). Also assume values of each field.
13. Write a Java servlet program to show passing of initialization parameters from web. XML.
14. (a) How to access MySQL database using JSP?
(b) Write a JSP program to implement any two JSP objects.
15. (a) Explain the structure of WSDL interface.
(b) Explain in detail about the structure and content of SOAP message.
16. (a) Explain the rich and user controls of ASP. NET
(b) Explain with an example how UDDI and WSDL work together.
17. (a) Explain the working of ASP.Net and AJAX, with suitable example.
(b) Discuss about the state management in ASP.NET

FACULTY OF ENGINEERING**B.E. (Civil) IV - Semester (CBCS) (Backlog) Examination, March / April 2022****Subject: Numerical Methods****Time: 3 Hours****Max. Marks: 70****(Missing data, if any, may be suitably assumed)****PART – A****Note: Answer all questions.****(10 x 2 = 20 Marks)**

1. Find the interval of unit length which contains a root of $x^3 - x - 1 = 0$.
2. Derive Newton-Raphson iterative formula to find $\sqrt{7}$.
3. Define eigenvalues and eigenvectors of a matrix.
4. Construct divided difference table for the following data:

x	0	1	3	6
y	18	10	-18	90

5. Derive expression for finding $\frac{dy}{dx}$ using Newton's forward interpolation.
6. Evaluate $\int_0^6 \frac{dx}{1+x}$ using Simpson's $\frac{1}{3}$ rule with $h = 1.5$.
7. Using Euler's method, find $y(0.2)$ for $y' = x - y$, $y(0) = 1$.
8. Explain Picard's method of successive approximations for solving $y' = f(x, y)$, $y(x_0) = y_0$.
9. Determine whether the equation $(x + 1)u_{xx} - 2(x + 2)u_{xy} + (x + 3)u_{yy} = 0$ is hyperbolic or elliptic.
10. Find the finite difference approximation for the partial derivative $\frac{\partial u}{\partial x}$.

PART – B**Note: Answer any five questions.****(5 x 10 = 50 Marks)**

11. Solve the system of equations $x_1 + x_2 - x_3 = 2$, $2x_1 + 3x_2 + 5x_3 = -3$, $3x_1 + 2x_2 - 3x_3 = 6$ by LU Decomposition method.
12. Using Givens method, find all the eigenvalues of the matrix.

$$A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

13. Evaluate the double integral $\int_1^2 \int_1^2 \frac{dx dy}{x+y}$ using Trapezoidal rule with $h = k = 0.5$ and $h = k = 0.25$.

14. Using Range-Kutta method of order 4, compute $y(1 \cdot 1)$ and $y(1 \cdot 2)$ for the equation $y' = 3x + y^2, y(1) = 1.2$.

15. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the condition $u(x, 0) = 0, u(0, t) = 0$ and $u(1, t) = t$ taking $h = \frac{1}{2}$ and $k = \frac{1}{8}$ by Crank-Nicolson method.

16. (a) Using bisection method find the negative root of $x^3 - 4x + 9 = 0$.

(b) Perform the first three approximations of Jacobi's iteration method to solve $8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 35$.

17. (a) Find the value of $f(5)$ from the following data:

x	4	6	8	10
f(x)	1	3	8	16

(b) Using Lagrange's interpolation, fit a polynomial to the following data:

X:	0	1	3	4
Y:	-12	0	6	12

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FACULTY OF ENGINEERING

B.E. (EEE/EIE/MECH/PROD/AE) IV - Semester (CBCS) (Backlog) Examination,
March / April 2022

Subject: Engineering Mathematics - IV

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

- Find the Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & x > a \end{cases}$.
- If $F\{f(x)\} = F(s)$ and $F\{g(x)\} = G(s)$ then, prove that $F\{af(x) + bg(x)\} = aF(s) + bG(s)$, where a, b are constants.
- Find the Z transform of $\{e^{2n}\}$.
- State initial value theorem of Z transforms.
- Find the interval of unit length which contains a root of $x^3 - 11 = 0$.
- Using Euler's method, find $y(0.1)$ for $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$.
- Write the normal equations for fitting a line of the form $y = ax + b$.
- Show that the correlation coefficient is the geometric mean of regression coefficients.
- Define uniform distribution.
- Let A and B be two events such that $P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cup B) = 0.8$. Find $P(A/B)$.

PART – B

Note: Answer any five questions.

(5x10 = 50 Marks)

- Find The Fourier transform of $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$. Hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$.
- Find the inverse Z transform of $\frac{z^2}{(z+2)(z-1)^2}$.
- Using Gauss-Seidel iteration method, solve the system of equations $4x + y + 2z = -1$, $x + 5y + z = 5$, $2x + y + 4z = 3$.
- From the following data, find the two regression lines equations and calculate the correlation coefficient.

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15
- The heights of 8 males participating in an athletic championship are found to be 175cm, 168cm, 165cm, 170cm, 167cm, 160cm, 173cm and 168cm. Can we conclude that the average height is greater than 165cm? Test at 5% level of significance.

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- 16 (a) Find the Fourier sine transform of $f(x) = e^{-|x|}$.
(b) Using Newton-Raphson method, find the square root of 10.
- 17 (a) Fit a curve of the form $y = ax^2 + bx + c$ for the following data:

x	-3	-1	1	3
y	15	5	1	5

- (b) State and prove Baye's theorem.

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FACULTY OF ENGINEERING

B.E. (CSE) IV – Semester (CBCS) (Backlog) Examination, March / April 2022

Subject: Mathematics and Statistics

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

- Find a real root of the equation $x^3 - 3 = 0$ by bisection method.
- State Newton's forward and backward difference interpolation formulae.
- If $F\{f(x)\} = F(s)$ and $F\{g(x)\} = G(s)$, prove that $F\{af(x) + bg(x)\} = aF(s) + bG(s)$, where a and b are constants.
- Find the finite Fourier sine transform of $f(x) = x, 0 < x < \pi$.
- If a/b and b/c , prove that a/c .
- Define prime and composite numbers.
- Find the mean of uniform distribution.
- Let A and B be two events such that $P(A)=0.5$, $P(B)=0.6$ and $P(A \cup B)=0.8$. Find $P(A/B)$.
- Write normal equations for fitting a second degree curve of the form $y = ax^2 + bx + c$.
- The two lines of regression are $8x - 10y + 66 = 0$, $40x - 18y - 214 = 0$. Find the mean values of x and y .

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- (a) Solve the following system of equations by Gauss elimination method.
 $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.
 (b) Apply Taylor's series method to find an approximate value of y at $x = 0.2$ and 0.4 for $y' = 2y + 3e^x, y(0) = 0$.
- Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$. Hence show that

$$\int_0^{\infty} \frac{x \cos x - \sin x}{x^3} \cos\left(\frac{x}{2}\right) dx = \frac{-3\pi}{16}$$
.
- (a) Find the integers x and y such that $\gcd(24, 138) = 24x + 138y$.
 (b) Find the remainder when $1! + 2! + 3! + \dots + 120!$ is divided by 6.
- The I.Q of the students in an elementary school were tested. A random sample of 7 students had the following I.Q's : 85, 96, 105, 102, 82, 89, 90.
 Does the data support the claim of a population mean of I.Q 100? Test at 5 % level of significance.

15. (a) Show that the angle θ between the two regression lines is

$$\theta = \tan^{-1} \left\{ \frac{1-r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2} \right\}.$$

(b) Find the rank correlation coefficient from the following data:

x :	1	2	3	4	5	6
y :	7	8	6	5	3	4

16. (a) Find $y'(0)$ and $y''(0)$ from the following table:

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

(b) Find the Fourier cosine transform of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & x > a \end{cases}$.

17. (a) If X is normally distributed with mean 100 and standard deviation 15, find $P(X \leq 130)$.

(b) Fit a straight line of the form $y = a + bx$ to the following data:

x :	0	1	2	3	4
y :	1	1.8	1.3	2.5	6.3

FACULTY OF ENGINEERING

B.E. (IT) IV - Semester (CBCS) (Backlog) Examination, March / April 2022

Subject: Signals & Systems

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

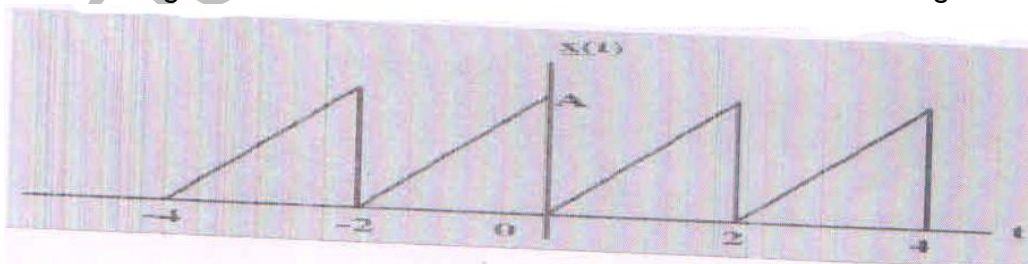
- 1 Define unit impulse signal and write its properties.
- 2 Sketch the following signals
(i) $2u(t+2) - 2u(t-3)$ (ii) $r(-t)u(t+2)$.
- 3 Define LTI system.
- 4 How do you obtain exponential Fourier series coefficients from trigonometric Fourier series coefficients?
- 5 Differentiate between Fourier Transform and Laplace Transform.
- 6 Find the Laplace Transform of unit step signal and its ROC.
- 7 Sketch the following signals
(i) $u(n) - u(n-4)$ (ii) $u(-n+4) - u(n)$.
- 8 Explain Sampling.
- 9 Find the Z-transform of $x(n) = n\delta(n)$.
- 10 State any two properties of DTFT.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) Determine whether the following signals are energy signals or power signals and calculate their energy or power.
(i) $t^3u(t)$ (ii) $r(t-2) - r(t-3)$.
 - (b) Find the linearity and Invariance of the following systems
(i) $y(t) = 2x^2(t)$ (ii) $y(t) = x(t^2)$.
- 12 Obtain the trigonometric Fourier series for the waveform shown in figure below



- 13 (a) Find the Fourier Transform of the signal

$$x(t) = \begin{cases} 1 & \text{for } -1 \leq t \leq 1 \\ 0 & \text{for otherwise.} \end{cases}$$

- (b) Determine Laplace Transform of the signal $x(t) = e^{-at}u(t) - e^{-bt}u(-t)$.

- 14 (a) Define Nyquist frequency for band limited signal.
- (b) State and prove sampling theorem.

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15 (a) Find the Z-Transform and ROC of $X(z)$ for $x(n) = 3\left(\frac{5}{7}\right)^n u(n) + 2\left(-\frac{1}{3}\right)^n u(n)$.

(b) Consider rectangular pulse $X(n) = \begin{cases} A & \text{for } |n| \leq N \\ 0 & \text{for } |n| > N \end{cases}$ find DTFT.

16 (a) What are the basic operations on signals? Illustrate with example.
(b) Analogy between signals and vectors.

17 (a) Compare of continuous time signal analysis with discrete time signal analysis.
(b) Write short notes on ideal and practical filters.

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FACULTY OF ENGINEERING

B.E. (ECE) IV - Semester (CBCS) (Backlog) Examination, March / April 2022

Subject: Applied Mathematics

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(10 x 2 = 20 Marks)

- 1 If u, v, w are linearly independent vectors in R^3 , then show that $u + v, v + w, w + u$ are also linearly independent in R^3 .
- 2 Define a linear transformation.
- 3 Find the interval of unit length which contains a root of the equation $x^3 - 2 = 0$.
- 4 State Newton's forward difference interpolation formula.
- 5 Using Euler's method, find the approximate value of $y(0.2)$ for $y' = x + y, y(0) = 1$.
- 6 Write Runge-Kutta method of 4th order formula.
- 7 Write the normal equations for fitting a curve of the form $y = a + bx + cx^2$.
- 8 Show that the coefficient of correlation is the geometric mean of the regression coefficients.
- 9 Define a basic feasible solution of LPP.
- 10 Write the LPP: $Max z = 30x + 20y$ subject to $-x + y \leq 5, 2x + y \leq 10, x, y \geq 0$ in normal form.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) Determine whether the vectors $(1,0,0), (0,1,0), (0,2,3)$ form a basis of R^3 .

(b) Let $T : R^3 \rightarrow R^2$ be a linear transformation defined by $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} y+z \\ y-z \end{pmatrix}$. Find the

matrix of the linear transformation to the standard basis $\left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$ in R^3 and

$\left\{ \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix} \right\}$ in R^2 .

- 12 (a) Find the square root of 35 correct to two decimal places using bisection method.

(b) Use Lagrange's interpolation to find $f(2)$ from the following data:

$x:$	0	1	3	4
$f(x):$	5	6	50	105

..2..

- 13 Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x=1.5$ from the following data:

$x:$	1.5	2.0	2.5	3.0	3.5	4.0
$y:$	3.375	7.0	13.625	24	38.875	59.0

- 14 Find the coefficient of correlation between x and y and also find the two regression lines for the data given below.

$x:$	1	3	4	5	7	8	10
$y:$	2	6	8	10	14	16	20

- 15 Solve the following LPP by Simplex method.

$$\text{Minimize } z = 5x_1 - 20x_2$$

$$\text{Subject to } -2x_1 + 10x_2 \leq 5, 2x_1 + 5x_2 \leq 10, x_1 \geq 0, x_2 \geq 0.$$

- 16 Solve the following system of equations by Gauss-Seidel iteration method.

$$8x + y + z = 8, 2x + 4y + z = 4, x + 3y + 5z = 5.$$

- 17 (a) Find the value of $y(0.4)$ by Picard's method, given that $y' = x^2 + y^2$, $y(0) = 0$.

- (b) If $x = 4y + 5$ and $y = kx + 4$ are two lines of regression, show that $0 \leq k \leq \frac{1}{4}$.

Find the means of the variables x and y when $k = \frac{1}{8}$.
