FACULTY OF ENGINEERING
B.E. 2/4 (Civil/ECE/CSE/AE) II – Semester (Backlog) Examination, December 2019

Subject: Environmental Studies

Time: 3 hours   **Max. Marks: 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Differentiate renewable and non-renewable energy resources. (2)
2 Discuss the effects of excessive use of fertilizers in agriculture. (3)
3 Write the causes and effects of earthquake. (3)
4 What are fossil fuels? Give two examples. (2)
5 Explain Eutrophication. (2)
6 Write any two national conflicts over water. (3)
7 What is genetic diversity? (2)
8 Write the causes for ground water pollution. (3)
9 Mention few reasons for land degradation. (3)
10 Explain the concept of sustainable development. (2)

PART – B (5 x 10 = 50 Marks)

11. a) Briefly explain the scope and importance of environmental studies. (5)
     b) What is deforestation? Explain its causes, effects and control measures. (5)

12. a) Explain the concept of energy flow in an ecosystem with the help of a neat sketch. (5)
     b) Define ecosystem. Explain the functions of ecosystem in detail. (5)

13. a) Explain in detail the values of biodiversity. (5)
     b) Write a short notes on endangered and endemic species of India. (5)

14. a) Explain the causes, effects and control measures of water pollution. (5)
     b) Write the salient features of the Forest conservation act 1981. (5)

15. a) Write the causes, effects and control measures of ozone layer depletion. (5)
     b) Write short notes on (5)
     (i) Green house effect (ii) Disaster management

16. a) Write short notes on (5)
       (i) Soil erosion (ii) Water logging (ii) Estuary
     b).What is Ecological pyramids. Explain different types of pyramids. (5)

17.a) Explain in detail about the hydrological cycle. (5)
     b) Explain in detail the environmental issues with the use of nuclear power plants. (5)

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FACULTY OF ENGINEERING
B.E. 2/4 (EEE) II-semester (Backlog) Examination, December 2019
Subject : Power System - I

Time:3 Hours   **Max. Marks: 75**

Note: Answer All Questions From Part-A & any Five Questions From Part-B.

PART- A (25 Marks)

1 Explain flow duration curve and mass curve.   3
2 Discuss the importance of diversity factor and plant usage factor of loads in power system.   3
3 What is surge tank? Explain.   2
4 Define the terms thermal efficiency and overall efficiency of steam power station. 2
5 Discuss the advantages and disadvantages of non-conventional energy sources.   3
6 Draw the schematic diagram of a solar power plant.   3
7 Name the various materials that are used for overhead line insulators. Why glass insulator cannot be used above 50KV?   2
8 List the various parts of cables.   2
9 What do you understand by transposition in overhead lines? Explain why Transposition is done in such line.   3
10 Explain the terms skin effect and proximity effect.   2

PART- B (50 Marks)

11 a) Explain the function of Economizers and Air pre heater.   5
   b) Draw the schematic diagram of a modern Hydro power plant and explain it's major parts.   5

12 a) Explain the working principle of nuclear power generation with neat diagram.   5
   b) Discuss the function of basic components of wind energy conversion plant.   5

13 a) Explain the different types of tariffs.   5
   b) Explain depreciation by sinking fund method.   5

14 A 1.5 Km long single phase 2-wire feeder supplies the loads as under.
       60A at 0.8 pf. (lagging), 600m from the feed point
       40A at 0.85 pf (lagging), 1200m from the feed point
       50A at 0.88 pf (lagging), 1500m from the feed point
       The resistance and reactance of the feeder per Km length(go and return) are 0.12 ohms and 0.2 respectively. If the voltage at the far end is to be maintained at 220V, calculate the voltage of the sending end and its phase angle with respect to the receiving end voltage.   10

15 a) Explain capacitance grading of a cable.   5
   b) Derive the expression for sag of a line supported between two supports of the same height.   5

16 a) Discuss the methods for improving the string efficiency of overhead line insulator. 5
   b) What are the factors governing the capacitance of a transmission line? Derive the expression for the capacitance of an unsymmetrical transposed 3 - phase transmission line.   5

17 Derive an expression for the insulator per phase for a 3-phase overhead transmission line when.   10
   i) Conductors are symmetrically placed
   ii) Conductors are unsymmetrical placed but the line is completely transposed.

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FACULTY OF ENGINEERING
BE 2/4 (Inst.) II – Semester (Backlog) Examination, December 2019

Subject: Thermodynamics & Fluid Mechanics

Time: 3 Hours   Max. Marks: 75

Note: Answer all questions from Part-A, & any five questions from Part-B.
PART – A (25 Marks)

1 Explain Clausius inequality?
2 Define second law of thermodynamics.
3 List out the applications of reciprocating air compressor.
4 Explain efficiency of multi-stage compressor.
5 Define specific weight and specific volume.
6 Explain uniform and non-uniform flow.
7 List out flow measuring devices.
8 Define impulse momentum equation
9 Write short notes on Darcy friction factor.
10 What do you understand by turbulent flow in circular pipes?

PART – B (5x10 = 50 Marks)

11 An engine working on the otto cycle has a suction pressure of 1 bar and a pressure of 14 bar at the end of compression. Find
    i) Compression ratio
    ii) Clearance volume as a percentage of cylinder volume
    iii) The ideal efficiency and MEP if the pressure at the end of combustion is 21 bars.

12 a) Explain the working principle of open cycle gas turbine with a neat sketch?
    b) A gas turbine unit has a pressure ratio of 5:1 and maximum cycle temperature of 600^oC. The isentropic efficiencies of the compressor and turbine are 0.7 and 0.8 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15^oC at the rate of 15 kg/s. Take C_p =1.005 kJ/kg-K and   = 1.4 for the compression process, and take C_p =1.11 kJ/kg-K and   = 1.333 for the expansion process.

13 Define equation of continuity. Obtain an expression of continuity of equation for a three-dimensional flow.

14 Name the different force present in a fluid flow. For the Euler's equation of motion, which forces are taken into consideration?

15 For a laminar flow through a circular pipe, prove that:
    i) The shear stress variation across the section of the pipe is linear and
    ii) The velocity variation is parabolic.

16 a) Explain the principle of venturimeter with a neat sketch. Obtain an expression.
    b) Discuss the relative merits and demerits of venturimeter with respect to orifice meter.

17 a) Detail classification of gas turbines.
    b) Expression of work done in steam turbine.
    c) Explain principles of increase in entropy in irreversible process.

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FACULTY OF ENGINEERING
B.E. 2/4 (M/P) II - Semester (Backlog) Examination, December 2019

Subject : Thermo Dynamics

Time : 3 Hours   **Max. Marks: 75**

Note: Answer all questions from Part-A & any five questions from Part-B.
PART – A (25 Marks)

1 Explain ideal gas thermometer?

2 How is thermodynamic equilibrium different from thermal equilibrium?

3 How first law of thermodynamics applicable to constant volume process and what is the conclusion.

4 Define path function and quasi-static process.

5 Show that entropy is a property of a system.

6 Differentiate between available energy and unavailable energy in steady flow.

7 List out at least three flow measuring devices.

8 Explain concept of phase change.

9 What is thermal efficiency of Carnot cycle? Explain T-S and P-h Diagrams.

10 What is molecular mass and specific heats of the gas mixtures?

PART-B (50 Marks)

11 a) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3. Assuming that the pressure and volume are related by pv^n = constant, find the work done by the gas system. [6]

  b) What is an ideal gas thermometer? What are its applications? [4]

12 A gas of mass 1.5 kg undergoes a quasi-static expansion which follows relationship p=a+bV, where a and b are constants. The initial and final pressures are 1000 kPa and 200 kPa respectively and the corresponding volumes are 0.20 m^3 and 1.20 m^3. The specific internal energy of the gasis given by the relation u = l.5 pv –85 kJ/kg. Where p is the kPa and v is in m^3/kg. Calculate the net heat transfer and the maximum internal energy of the gas attained during expansion. [10]

13 a) Prove that the COP of a reversible refrigerator operating between two given temperatures is the maximum. [5]

  b) State and explain Clausius inequality. [5]

14 Steam at pressure 15bar and 0.95 dry is generated in a boiler and is made to pass through its super heater where additional quantity of heat is supplied to heat at constant pressure. Consequently, the temperature of steam increases to 350^{0}C. Determine the following (a) heat supplied in the super heater and (b) change in internal energy. Use Mollier diagram. [10]

15 a) Explain the working principle of Rankine cycle using P-V and T-S diagrams? [6]

  b) Differentiate between Otto and Diesel engine. [4]

..2

16 In a Stirling cycle the volume varies between 0.03 and 0.06 m^3 , the maximum pressure is 0.2 MPa, and the temperature varies between 540°C and 270°C. The working fluid is air (an ideal gas). (a) Find the efficiency and the work done per cycle for the simple cycle. (b) Find the efficiency and the work done per cycle for the cycle with an ideal regenerator, and compare with the Carnot cycle having the same isothermal heat supply process and the same temperature range. [10]

17 a) What happens to the change of temperature for an ideal gas subjected to throttling process? [4]
   b) What happens to an incompressible fluid undergoing Joule-Kelvin expansion? [3]
   c) Write down the entropy balance equation for (a) closed system and
      (b) open system under steady state condition. [3]

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FACULTY OF ENGINEERING

B.E. 2/4 (I.T) II-semester (Backlog) Examination, December 2019

Subject : Web Technologies

Time: 3 Hours   **Max. Marks: 75**

Note: Answer All Questions From Part-A & any Five Questions From Part-B.

PART- A (25 Marks)

1	List any four ASP.NET validation controls.	2
2	What is XML Processor?	2
3	List the differences between HTML and XHTML.	3
4	Justify how schema is better over DTD?	3
5	List the characteristics of array objects in JavaScript.	3
6	Explain the difference between JSP and SERVLET.	3
7	List the different types of CSS Selectors?	2
8	What is AJAX?	2
9	State the features of WSDL.	3
10	Write Java script function to validate email-id.	2

PART- B (50 Marks)

11.a) Write XHTML code to insert image element.   3
   b) Design an XHTML form to include the following elements.   7
       i)Text box ii) 3 checkboxes iii)2 radio buttons iv)reset and submit buttons

12. Design an XML document to store book information in a library. The book details
    should include 6 book titles, author, price, number of pages. The books should be
    arranged according to the category.(eg. Computers, electronics)   10

13. a) Explain the servlet life cycle.   6
    b) What are the different action tags used in JSP?   4

14. a) Describe the general structure of SOAP message and explain.   5
    b) Explain the differences between SOAP and REST.   5

15.a) Explain different web form controls in ASP.Net with examples.   5
    b) Explain different validation controls that are used in ASP.NET   5

16. Design a HTML page to display name, fathers name, designation, address in a form.
     Write a Servlet Program to display the form data in a table.   10

 17. Write short note on
     a) XML parsers   4
     b) session tracking   3
     c) UDDI   3

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FACULTY OF ENGINEERING

B.E. (Civil) IV - Semester (CBCS) (Suppl.) Examination, December 2019

Subject : Numerical Methods

Time : 3 Hours   **Max. Marks: 70**

Note: Answer all questions from Part-A & any five questions from Part-B.

PART – A (20 Marks)

1 Explain Bisection method.   2
2 Solve the following system   2
   $x + 4y + 9z = 16, 3x + 2y + 3z = 18, 2x + y + z = 10.$
   by Gauss elimination method
3 Write Newton's divided difference interpolation formula.   2
4 Construct Newton's backward difference table for following data   2

X	0	1	2	3
Y	1	0	1	10

5 Write Newton's forward difference formula for first two derivatives.   2

6 Evaluate $\int_1^3 \dfrac{1}{x}\, dx$ by Simpson's 1/3 rule with 4 strips.   2

7 Given $\dfrac{dy}{dx} - 1 = xy$ and $y(0) = 1$, using Taylor's series method

   compute $y(0.1)$ correct upto two decimal places.   2
8 Write Adams-Bashforth predictor formula.   2
9 Derive finite difference approximation to second order derivative using central
   difference approximation.   2
10 Solve the boundary value problem $y'' - 64y + 10 = 0$ with y (0) =y (1)=0 by
   finite difference method. Compute the value of y(0.5) taking h=1/2.   2

PART- B (50 Marks)

11 (a) Develop iterative formula for $\sqrt{N}$, using Newton-Raphson method and hence

   compute $\sqrt{8}$ correct upto three decimals.

                                                                               (5)
   (b) Apply Gauss-Seidel iterative method to solve the system of equations   (5)
        83x + 11y - 4z = 95
        7x + 52y + 13z = 104
        3x + 8y + 29z = 71.

12 (a) Find Eigen values of the following symmetric matrix by Jacobi's method.   (5)

$$\begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}$$

   (b) Given the set of points (1, -3), (3, 9), (4, 30) and (6, 132), obtain the value of y
       when x=2 using Newton's divided difference formula.   (5)

13 (a) From the following table of values of x and y, obtain $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ for x=2.0.   (5)

x	1.0	1.2	1.4	1.6	1.8	2.0
f(x)	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891

   (b) Evaluate $\iint e^{x+y}\,dx\,dy$ with limits of x and y are 0 to 1 using Simpson's rule with h=k=0.25.   (5)

14 (a) Apply Euler's method, solve for y at x=1.2 from $\dfrac{dy}{dx} = \log(x+y), y(0) = 2,$

   taking step size 0.2.   (5)

   (b) Use three point Gaussian quadrature formula to evaluate $\int_0^{f/2} \sin x\, dx$.   (5)

15 The deflection of a beam is governed by the equation $\dfrac{d^4y}{dx^4} + 81y = \{(x)$ where

   $\{(x)$ is given by the table

x	1/3	2/3	1
$\varphi(x)$	81	162	243

   and the boundary condition y(0) = y (0)=y (1)= y (1)=0. Evaluate the deflection at the pivotal points of the beam using three subintervals.   (10)

16 (a) Apply Runge-Kutta fourth order method, to find an approximate value of y when

   x=0.2, given that $\dfrac{dy}{dx} = \dfrac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$.   (5)

   (b) The area of a circle of diameter d is given for the following values: (5)

d:	80	85	90	95	100
A:	5026	5674	6362	7088	7854

   Calculate the area of diameter 105.

17 (a) Apply LU decomposition method to solve the system of linear equations.   (5)
      3x+2y+7z=4
      2x+3y+z=5
      3x+4y+z=7
   (b) Using Picard's approximation method, obtain a solution upto second approximation of the equation $\dfrac{dy}{dx} = x + y$, such that y = 1 when x=0.   (5)

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FACULTY OF ENGINEERING
B.E. IV-Semester (EE/Inst./M/P/AE) (Suppl.) Examination, December 2019

Subject : Engineering Mathematics – IV

Time : 3 Hours   Max. Marks: 70

Note: Answer all questions from Part-A & any five questions from Part-B.

PART – A (20 Marks)

1 Solve the integral equation $\int_0^\infty f(x)\cos sx\, dx = e^{-s}$.   (2)

2 If F{ f(x) } = F(s), show that $F\{f(ax)\} = \dfrac{1}{a}F\left(\dfrac{s}{a}\right), a \neq 0$.   (2)

3 Determine $Z\left\{\sin\dfrac{nf}{4}\right\}$.   (2)

4 If $Z\{f_n\} = \dfrac{z}{z-1} + \dfrac{z}{z^2+1}$, find $Z\{f_{n+1}\}$.   (2)

5 Perform first two approximations of bisection method to solve $e^{-x} = x$.   (2)

6 If $f(x) = \dfrac{1}{x}$, find the divided differences f(a, b) and f(a, b, c).   (2)

7 Write the normal equations for fitting a curve of the form y = ax^2 + bx + c.   (2)

8 The two regression line equations are x = -0.4y + 6.4 and y = - 0.6 x + 4.6.
   Find the correlation coefficient r.   (2)

9 State Baye's theorem.   (2)

10 Find the mean of the exponential distribution.   (2)

PART – B (50 Marks)

11 (a) Find the Fourier transform of $f(x) = e^{-x^2}$.   (5)

   (b) Find the Fourier sine transform of $f(x) = e^{-x}$ and hence show that

   $$\int_0^\infty \frac{x\sin \}x}{1+x^2}\,dx = \frac{f}{2}\,e^{-\}},\quad \} > 0 .$$ (5)

12 (a) Find $Z^{-1}\left\{\dfrac{3z^2 + z}{(5z-1)(5z+2)}\right\}$.   (5)

   (b) State scaling property of Z transforms and hence find Z{ 2^n Sin nθ }.   (5)

13 (a) Use Gauss – Seidel method to solve the system of equations
       $3x + y + z = 1$, $x + 3y - z = 11$, $x - 2y + 4z = 21$ (5)

   (b) Find the approximate value of y(0.1) for y′=3x + y^2, y(0) = 1 by Taylor
       series method.   (5)

..2

14 (a) Find the regression line of y on x for the following data: (5)

x	2	4	6	8	10	12	14
y	4	2	5	10	4	11	12

and hence estimate y when x = 13.

(b) Calculate the rank correlation coefficient for the following data: (5)

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

15 (a) A random variable X has the following probability distribution

x	0	1	2	3	4
P(x)	k	2k	2k	k^2	$5k^2$

Find k and Var (4X + 5).   (5)

(b) Test whether the following two random samples come from the same normal population at 5% level at significance.   (5)

Sample	Size	Sum of squares of deviations from the mean
1	10	90
2	12	108

(Given $F_{0.05}$ (9, 11) = 2.90)

16 (a) Find the finite Fourier cosine transform of f(x) = 2x in [0, 4].   (5)

(b) If f_n = n and g_n = n^2, find Z {$f_n * g_n$}, where $f_n * g_n$ is the convolution of the sequences {f_n} and {g_n}.   (5)

17 (a) Find $\dfrac{d^2 y}{dx^2}$ at x = 3 from the following data.   (5)

x	0	1	2	3
y	1	3	15	40

(b) If X is normally distributed with mean 100 and the standard deviation 15, find the probability that X does not exceed 130.
(Given $P(0 \le Z \le 2)$ = 0.4772)   (5)

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FACULTY OF ENGINEERING

B.E. (ECE) IV-Semester (Suppl.) Examination, December 2019

Subject : Applied Mathematics

Time : 3 Hours   **Max. Marks: 70**

Note: Answer all questions from Part-A & any five questions from Part-B.

PART – A (20 Marks)

1 Define basis.   (2)

2 If T is a linear transformation from $\mathbf{R}^3$ into $\mathbf{R}^2$, where
$$Tx = Ax, \quad A = \begin{pmatrix} 1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix}$$ and $x = (x \ y \ z)^T$, find ker (T).   (2)

3 Find the interval of unit length which contains a root of $3x - \cos x - 1 = 0$.   (2)

4 Construct the divided difference table for the following data   (2)

x	-3	-2	-1	1	2	3
y	18	12	8	6	8	12

5 Write the expressions for finding $\dfrac{dy}{dx} \ and \ \dfrac{d^2 y}{dx^2}$ and using Newton's forward interpretation formula.   (2)

6 Obtain the approximate value of y(1.2) for $y' = -2xy^2$, y(1)=1 using Euler's method.   (2)

7 Show that the two regression coefficients and correlation coefficient have the same sign.   (2)

8 The two lines of regression are 5y – 8x + 17 = 0 and 2y – 5x + 14 = 0. If Var(y)=16, find Var (x).   (2)

9 What is a linear programming problem?   (2)

10 Define basic feasible solution.   (2)

PART – B (50 Marks)

11 (a) Let V be the vector space of all 2x2 real matrices. Show that the set
$$S = \left\{ \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix} \right\}$$ spans V   (5)

(b) Let V and W be two vector spaces in R^3. Let T : V → W be a linear transformation defined by $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ x + y \\ x + y + z \end{pmatrix}$. Find the matrix representation of T w.r.t the to the ordered basis { $(1, 0, 0)^T$, $(0, 1, 0)^T$, $(0, 0, 1)^T$ } in V and W.   (5)

12 (a) The equation $x^3 - 5x - 1 = 0$ has a root in the interval (-1, 0). Determine
   this root correct to two decimal places using Regular-Falsi method. (5)

   (b) Solve the system of equations $2x + 3y - z = 5$, $4x+4y-3z=3$, $-2x+3y-z=1$
   using Gauss elimination method. (5)

13 (a) Find $y''(3)$ from the following data: (5)

x	-3	-2	-1	0	1	2	3
y	13	7	3	1	1	3	7

   (b) Apply Picard's method to find $y(0.1)$ for $y' = 3x + y^2$, $y(0) = 1$. (5)

14 (a) Fit a least square geometric curve $y = ax^b$ to the following data: (5)

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

   (b) If θ is the acute angle between the two regression lines, show that

   $\tan_n = \dfrac{1-r^2}{r} \dfrac{\dagger_x \dagger_y}{\dagger_x^2 + \dagger_y^2}$. Explain the significance of the formula (5)

   when $r = 0$ and $r = \pm 1$.

15 Use simplex method to solve the following problem (10)

   Maximize $Z = 3x_1 + 4x_2$

   Subject to $x_1 + x_2 \le 450$

   $2x_1 + x_2 \le 600$, $x_1 \ge 0$, $x_2 \ge 0$

16 (a) Find the rank and nullity of the transformation $T : \mathbf{R}^2 \to \mathbf{R}$,

   where $T\begin{pmatrix} x \\ y \end{pmatrix} = x + 3y$. (5)

   (b) Find the Lagrange interpolating polynomial from the following data: (5)

x	-1	2	3	4
y	-1	11	31	69

17 Show that $r = \dfrac{\dagger_x^2 + \dagger_y^2 - \dagger_{x-y}^2}{2\dagger_x \dagger_y}$ and hence find 'r' from the following data: (10)

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

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FACULTY OF ENGINEERING

B. E. (CSE) (CBCS) IV – Semester (Supplementary) Examination, December 2019

Subject: Mathematics & Statistics

Time: 3 hours   Max. Marks: 70

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (20 Marks)

1. Explain Bisection method to find an approximate real root of f(x) = 0.   2

2. If $\dfrac{dy}{dx} = x^2 + y^2, y(0) = 1,$ find the value of y(0.3) using Euler's method.   2

3. State change of Scale property and Shifting property in Fourier Transforms.   2

4. Find Fourier cosine Transforur of $f(x) = \dfrac{e^{-x}}{x}.$ 2

5. Let d = (826, 1890). Use the Euclidian algorithm to compute d.   2

6. Find the remainder when 3^{50} is divided by 5.   2

7. State Baye's Theorem.   2

8. Find the variance of the Exponential distribution.   2

9. Derive normal equations for the parabola y = a+ bx + cx^2 using principle of least squares.   2

10. If θ is the acute angle between the two regression lines, show that
$\text{Tan}_\theta = \dfrac{1-r^2}{r} \dfrac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2},$ where r, σ$_x$, σ$_y$ have their usual meanings.   2

PART – B (50 Marks)

11. (a) Using Newton-Raphson method, find the real root of the equation 3x=cos x+1.   5

    (b) From the following table, estimate the number of students who obtained marks between 40 and 45.   5

Marks:	30-40	40-50	50-60	60-70	70-80
No. of students:	31	42	51	35	31

12. (a) Use Fourier Integral representation, to prove   5

$$\int_0^\infty \dfrac{\cos xw}{1+w^2}\, dw = \dfrac{f}{2} e^{-x}, x \geq 0.$$

    (b) Find Fourier Transform of $F(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$ 5

    Hence evaluate $\displaystyle\int_{-\infty}^{\infty} \dfrac{\sin ap \, \cos px}{p}\, dp.$

13. (a) State and prove Fermat's theorem. 5

(b) Find the solutions of the following linear congruences. 5

    (i) $5x \equiv 3(\text{mod } 24)$

    (ii) $25x \equiv 15(\text{mod } 120)$

14. (a) In two independent samples of size 8 and 10 the sum of squares of deviations of the sample values from the respective sample means were 84.4 and 102.3 Test whether the difference of variances of the populations is significant or not. 5

(b) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find
(i) How many students scores between 12 and 15.
(ii) How many score above 18. 5

15. (a) Obtain a relation of the form $y = ab^x$ for the following data by the method of least squares. 5

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

(b) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are eligible. Variance of x = 9, regression equations: $8x - 10y + 66 = 0$, $40x - 18y = 214$.
Find (i) the mean values of x and y.
    (ii) the standard deviation of y and
    (iii) the coefficient of correlation between x and y. 5

16. A sample of 12 fathers and their eldest sons have the following data about their heights in inches: 10

Father:	65	63	67	64	68	62	70	66	68	67	69	71
Son:	68	66	68	65	69	66	68	65	71	67	68	70

Calculate coefficient of rank correlation.

17. (a) Apply Runge-Kutha 4th order method, to find an approximate value of y when x = 0.2, given that $\dfrac{dy}{dx} = x + y, \quad y(0) = 1$. 5

(b) Find the Fourier cosine Transform of e^{-x^2}. 5

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FACULTY OF ENGINEERING

B.E IV – Semester (CBCS)(I.T) (Suppl.) Examination, December 2019
Subject: Signals and Systems

Time: 3 Hours   **Max Marks: 70**

### Note: Answer all questions from Part-A & Any Five Questions from Part-B
PART – A (20 Marks)

1. Sketch the following signal $x(t) = 2u(t+1) - 4u(t) + 3u(t-1) - u(t-2)$.   2

2. Define Signum function and relate it with unit step function.   2

3. Check whether the following system is linear or not   2

$$y(n) = x(n) + \frac{1}{2x(n-2)}$$

4. Give Dirichlet's conditions for Fourier Series.   2

5. Give the relation between Fourier Transform and Laplace Transform.   2

6. Evaluate the DTFT of $x(n) = u(n) - u(n-3)$.   2

7. Why are ideal filters not realizable?   2

8. Relate Trigonometric Fourier Series coefficients and Exponential Fourier Series Coefficients.   2

9. Find the Laplace transform of $e^{-3t}u(-t)$ and plot its ROC.   2

10. Using final value theorem, find x( ) if

$$X(z) = \frac{z+1}{(z-0.6)^2}$$

PART – B (50 Marks)

11. a) Determine whether the following signals are energy signals or power signals, and calculate its energy or power
      i) $t^3 u(t)$ ii) $10\,e^{-5t}u(t)$ iii) $(3+e^{2t})\,u(t)$ 6
   b) Check whether the following system is Time Invariant or not
      i) $y(t) = x(t) - tx(t-1)$
      ii) $y(t) = x(t)\cos 20t$

      4

12. Evaluate the Trigonometric Fourier Series of   10
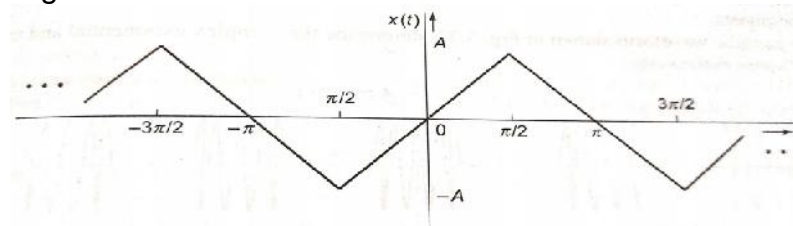
13. a) Find the Fourier Transform of Signum Function   4

   b) State and prove the following properties of Fourier transform   6

      i) Differentiation in time domain property

      ii) Duality Property

14. a) A system produces an output of $y(t) = te^{-3t} u(t)$ for an input of $x(t) = e^{-5t} u(t)$.

    Determine the impulse response and frequency response of the system.   6

  b) Find the Laplace Transform of the signal $x(t) = e^{-a|t|}$ and find its ROC   4

15. State and Prove Sampling theorem for band limited signals   10

16. a) Find the response of LTI discrete time system specified by the equation: 7

$$y(n) - \frac{3}{2}y(n-1) + \frac{1}{2}y(n-2) = 2x(n) + \frac{3}{2}x(n-1)$$

  If the initial conditions are y(-1) = 0 and

        Y (-2) = 1and the input

$$x(n) = (\frac{1}{4})^n u(n)$$

  b) State and Prove the Time shifting property of DTFT   3

17. Write short notes on

  a) Properties of Unit Impluse   4

  b) ROC of Laplace Transform   3

  c) Operations on discrete time signals   3

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