

FACULTY OF ENGINEERING**B. E. (Civil) III – Semester (CBCS) (Backlog) Examination, July 2021****Subject: Building Materials & Construction****Time: 2 hours****Max. Marks: 70****Note: Missing data, if any, may be suitably assumed.****PART – A****Answer any five questions.****(5x2 = 10 Marks)**

1. Define dressing of stone.
2. What are the harmful ingredients in brick earth?
3. What are the points to be considered in selection of site for cement factory?
4. Define bulking of sand.
5. What are the effects of improper curing?
6. What are the characteristics of an ideal paint?
7. Define form work and Scaffolding.
8. What is the most commonly used type of scaffolding in construction?
9. What are control joints in concrete?
10. What are the causes of cracks?

PART – B**Answer any four questions.****(4x15 = 60 Marks)**

11. (a) Explain the process of Blasting.
(b) Enumerate various defects in timber.
12. (a) What are the important properties of a good Mortar mix?
(b) Write a note on grading of aggregates, water cement ratio.
13. (a) Describe the field test for cement.
(b) Draw the flow diagram of burning and grinding operation involved in the manufacture of ordinary cement.
14. (a) Differentiate between plastering and pointing.
(b) What are the properties of Distempers?
15. (a) What are the requirements of a good form work?
(b) What are the safety measures to be considered while erection and dismantling of a scaffolding?
16. (a) Explain the classification of fire.
(b) Explain any 3 methods of damp proofing.
17. (a) Explain the types of joints in concrete.
(b) Explain the types of cracks in building.

FACULTY OF ENGINEERING

B.E. III-Semester (CBCS) (EE/Inst.) (Backlog) Examination, July 2021

Subject : Digital Electronics and Logic Design

Time : 2 Hours

Max. Marks: 70

Missing data, if any, may be suitably assumed

PART – A

Note: Answer any Five Questions

(5x2= 10 Marks)

1. Prove that $ABC + ABC' + AB'C + A'BC = AB + AC + BC$.
2. Implement the expression $X = (\overline{A} + \overline{B} + \overline{C})_{DE}$ by using NAND logic.
3. Compare and contrast the features of TTL and CMOS logic families.
4. How do you characterize or define a combinational circuit? How does it differ from a sequential circuit? Give two examples.
5. Draw the two bit comparator circuit using logic gates.
6. Illustrate the logic diagram of a clocked JK flip flop.
7. Compare the logics of synchronous counter and ripple counter.
8. Determine the resolution of a) a 6 bit DAC and that of b) a 4 bit DAC in terms of percentage.
9. Find the minterms of the logical expression: $Y = A'B'C' + A'B'C + A'BC + ABC'$
10. Convert $(4021.2)_5$ to its equivalent decimal.

PART – B

Note: Answer any Four Questions

(4x15= 60Marks)

11. a) Simplify the following SOP equation using the K-mapping procedure and realise The simplified equation using AND – OR gates.

$$Y = \overline{A}.\overline{B}.\overline{D} + \overline{A}.\overline{C}.\overline{D} + \overline{A}.\overline{B}.\overline{C} + \overline{A}.\overline{B}.\overline{C}.\overline{D} + \overline{A}.\overline{B}.\overline{C}.\overline{D}$$

- b) In a certain chemical-processing plant, a liquid chemical is used in a manufacturing process. The chemical is stored in three different tanks. A level sensor in each tank produces a HIGH voltage when the level of chemical in the tank drops below a specified point. Design a circuit that monitors the chemical level in each tank and indicates when the level in any two of the tanks drops below the specified point.
12. a) With the help of neat diagram explain the working of a two- input TTL NAND gate.
 b) Construct full subtractor using Demultiplexer.

13. a) Design a 4-bit decimal adder using 4-bit binary adders.
b) Design a sequence detector circuit to detect a sequence of 1011. It should produce an output 1 when the input pattern has been detected. Consider overlapping. Explain about carry look ahead adder and give its advantages over full adder.
14. a) Compare the diagram of a 4-bit SISO SIPO, PIPO and PISO shift register and draw its waveforms.
b) Design a type D counter that goes through states 0, 1, 2, 4, 0.... The undesired (unused) states must always go to zero(000) on the next clock pulse.
- 15.a) With the help of the neat diagrams explain the working of : R-2R ladder network type DAC.
b) Explain the working principle of successive approximation type ADC. Compare it over with digital ramp ADC.
16. Minimize the following function using Q-M approach
 $f(A, B, C, D) = \sum m(1, 4, 6, 9, 14, 17, 22, 27, 28) + d(12, 15, 20, 30, 31)$ and implement using only NAND gates.
17. a) Design a BCD to Gray code converter.
b) Explain the working of BCD Ripple Counter with the help of state diagram and logic diagram.

FACULTY OF ENGINEERING
BE III-Semester (ECE) (CBCS) (Backlog) Examination, July 2021

Subject: Network Analysis and Synthesis

Time: 2 Hours

Max .Marks: 70

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions.

(5x2=10 Marks)

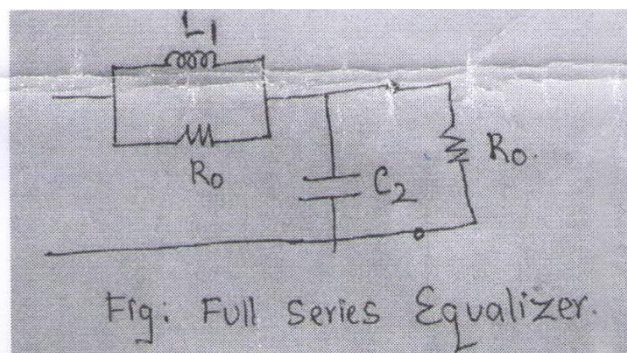
- 1 Differentiate between Symmetrical & Asymmetrical Networks.
- 2 Calculate Z_o of symmetrical network if $Z_{oc} = 600\Omega$ & $Z_{sc} = 500\Omega$.
- 3 What is the condition for a filter to be in pass band (i.e. to get $\alpha=0$)?
- 4 What are the draw backs of a Constant K Filters?
- 5 Convert 40 dB into Nepers?
- 6 What is an equalizer? Write any two applications of Equalizers?
- 7 Write any two properties of Laplace Transform.
- 8 Find the poles of $z(s)=s^2+6s+3/s^2+7s+5$.
- 9 What is a positive real function?
- 10 Give any two properties of RC Admittance function.

PART – B

Answer any four questions.

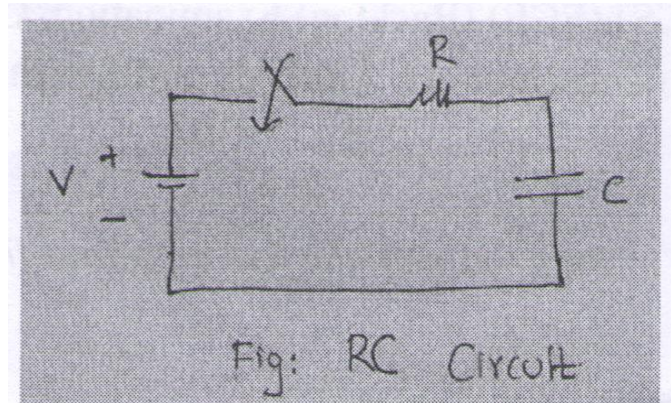
(4x15=60 Marks)

- 11 (a) Derive expression for characteristic Impedance of a Symmetrical Lattice Network.
 (b) If a T network has $Z_{oc}=800\Omega$, $Z_{sc}=600\Omega$, find the propagation constant.
- 12 Design a composite High Pass Filter having design resistance of 500Ω , Cutoff frequency $F_c=4$ KHz and Resonant frequency $F_\infty=3.2$ KHz
- 13 (a) Design a Symmetrical Lattice Attenuator to provide an attenuation of 40 dB and has design resistance $R_o=450\Omega$
 (b) Design a full series equalizer (Calculate L_1 & C_2) shown in figure which gives 20 dB attenuation at 900Hz and design resistance $R_o=650\Omega$.



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14 Determine step and impulse response of a series RC Circuit shown below figure?



15 Synthesize the LC Impedance function using Cauer Form-I & Form-II & Foster Form –I realizations

$$z(s) = \frac{(s^2+3)(s^2+5)}{s(s^2+4)(s^2+6)}$$

16 Design a Prototype band pass filter (T and π selections) that has cutoff frequencies of 2800 Hz and 5000 Hz nominal impedance of 650 Ω . Also determine the resonant frequencies of Series and Shunt Arms.

17 (a) Check whether the function is positive real or not.

$$Z(s) = \frac{(s^3+4s^2+7s+3)}{(s^3+3s^2+5s+6)}$$

(b) Define Iterative and Image Impedances of a Asymmetrical Network.

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FACULTY OF ENGINEERING
BE III-Semester (AE) (CBCS) (Backlog) Examination, July 2021

Subject: Fluid Mechanics & Machinery

Time: 2 Hours

Max .Marks: 70

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions.

(5x2=10 Marks)

- 1 Define the following (a) Dynamic viscosity (b) Bulk modulus
- 2 Define Surface Tension and write the formula of Surface tension on a liquid droplet.
- 3 Differentiate Steady flow and unsteady flow.
- 4 What is Velocity Potential Function?
- 5 Write the Chezy's formula and express each term in it.
- 6 Define the following:
 - (a) Drag force (b) Lift forces (c) Total energy line
- 7 Compare the Impulse Turbine and Reaction Turbine.
- 8 Differentiate between radial and axial flow turbines.
- 9 Define Percentage of Slip and Negative slip of a Reciprocating Pump.
- 10 What is Cavitation in pumps and write effects of Cavitation.

PART – B

Answer any four questions.

(4x15=60 Marks)

- 11 (a) Two horizontal plates are placed 1.25cm apart, the space between them filled with oil of viscosity 14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 2.5m/s.
 (b) How the Fluid are classified and explain them in detailed.
- 12 (a) An Orifice meter with diameter 15 cm is inserted in a pipe of 30cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury, find the rate of flow of oil specific gravity 0.9 when the co-efficient of discharge of orifice meter is 0.64.
 (b) What is the significance of Pitot tube? And how it is determined?
- 13 (a) Find the head lost due to friction in a pipe of diameter 300mm and length 50m through which water is flowing at a velocity of 3 m/s using (i) Darcy formula (ii) Chezy's formula for which $C=60$.
 (b) Explain the boundary layer separation?
- 14 (a) Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20 m/s. The net head on the turbine is 50m and discharge through the jet water is $0.03 \text{ m}^3/\text{s}$. The side clearance angle is 15 and take $C_v=0.975$.
 (b) Define specific speed of turbine and give its significance.
- 15 (a) Explain the working of double acting a Reciprocating Pump with a neat sketch.
 (b) Define the specific speed of a Centrifugal Pump and Derive an expression for the same.
- 16 Derive Euler's equation motion of fluid and how will you obtain Bernoulli's equation from it?
- 17 (a) What is vapour pressure and cavitation
 (b) What is laminar boundary Layer? Explain it.
 (c) What are various types of Draft tubes?

FACULTY OF ENGINEERING
BE III-Semester (IT) (CBCS) (Backlog) Examination, July 2021

Subject: Digital Electronic & Logic Design

Time: 2 Hours

Max .Marks: 70

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions.

(5x2=10 Marks)

- 1 What are universal gates? Why are they called so?
- 2 Simplify using Demorgan's theorem $f=a(b+c')$
- 3 Design half adder circuit.
- 4 What is decoder?
- 5 Write the truth table and excitation table of T flip flop & D flip flop.
- 6 Draw the circuit for ring counter using D flip flop.
- 7 What is the difference between a synchronous counter and Asynchronous counter?
- 8 Summarize the steps involved in designing a synchronous sequential circuit.
- 9 Write about setup and hold time of flip flop.
- 10 Define clock skew.

PART – B

Answer any four questions.

(4x15=60 Marks)

- 11 (a) Minimize the expression using Karnaugh Map and Write the VHDL code.
 $F(a, b, c, d) = \sum m (0, 1, 3, 6, 7, 8, 9, 13, 15)$
 (b) Minimize the function $(x+y)(x+y')$
- 12 (a) Explain the structure of FPGA.
 (b) Construct 8:1 Multiplexer using 4:1 Multiplexer and 2:1 Multiplexer.
- 13 Design a mod - 8 asynchronous up counter with the help of timing diagram.
- 14 Design a counter circuit using sequential circuit approach.
- 15 (a) Explain the state assignment problem with example.
 (b) Differentiate between Static and Dynamic Hazards.
- 16 (a) Explain architecture of CPLD
 (b) Construct full subtractor circuit using Half subtractor and basic gates.
- 17 Write short notes on the following:
 - (a) Explain about ASM chart.
 - (b) Implement the following function using NAND gate
 $\Sigma(x, y, z) = (1, 2, 3, 4, 5, 7)$

FACULTY OF ENGINEERING

BE III-Semester (CE/EE/EIE/CSE) (AICTE) (Main & Backlog) Examination, July 2021

Subject: Essence of Indian Traditional Knowledge

Time: 2 Hours

Max .Marks: 70

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions.

(5x2=10 Marks)

- 1 What is heritage? Explain
- 2 Define philosophy? and its nature.
- 3 How many Vedas? Explain in brief.
- 4 Explain the literature of South India.
- 5 What is religion? Explain.
- 6 Write a note on Upanishads?
- 7 What are the books written by Mahatma Gandhi?
- 8 What is the meaning of Non-Violence?
- 9 Explain the concept of Indian handicrafts.
- 10 Write a note on "Value based Education"

PART – B

Answer any four questions.

(4x15=60 Marks)

- 11 (a) Discuss the general characteristics of culture.
(b) Give a detailed account of culture and Civilization?
- 12 (a) What are the role of Sanskrit, significance of Scriptures to current society?
(b) Explain the Upanishads and schools of Vedanta?
- 13 (a) Discuss the relation between Religion and Philosophy?
(b) Explain the Mahatma Gandhi theory of Sarvodaya?
- 14 (a) Write short notes on "Arya Samaj"
(b) Discuss the contributions of Raja Ram Mohan Roy in the making of modern India?
- 15 (a) Write an essay on concept of "Indian Fine Arts"
(b) Give a detailed account of Dance and Drama?
- 16 (a) Explain the development of science in Ancient India.
(b) Write a note on ethical issues arising in science and Technology?
- 17 (a) Explain the role Gurukulas in Education system.
(b) What are the aims of Education system in modern India?

FACULTY OF ENGINEERING
BE III-Semester (ECE/M/P/AE/IT) (Main & Backlog) Examination, July 2021

Subject: Effective Technical Communication in English

Time: 2 Hours

Max .Marks: 70

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions.

(5x2=10 Marks)

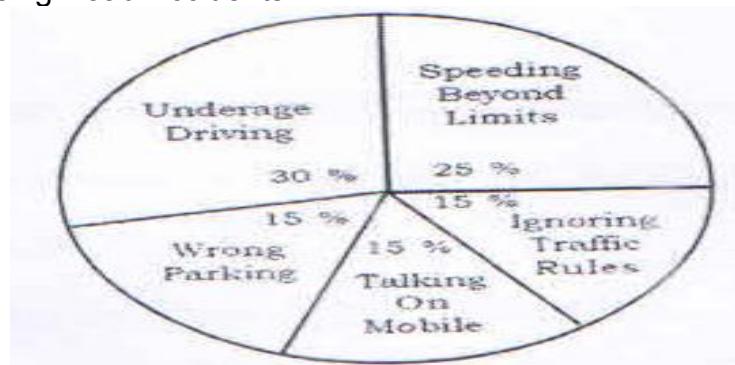
- 1 Define Technical Communication?
- 2 What factors determine the language of technical communication?
- 3 What does precision or accuracy refer to in technical communication?
- 4 Write a few advantages of using e-mail. What is E-mail etiquette?
- 5 How is the option BCC useful in e-mail.
- 6 How is a user guide different from a manual?
- 7 What aspects go in planning a presentation?
- 8 Mention any two advantages of using visual aids.
- 9 When is a bar graph used?
- 10 Write any two advantages of visual or graphical representation of information.

PART – B

Answer any four questions.

(4x15=60 Marks)

- 11 (a) Bring out the differences between technical and general communication.
 (b) Explain briefly the types of technical communication with two examples of each.
- 12 (a) Discuss briefly characteristics of successful e-mail messages.
 (b) A number of scooters and cars are parked in your locality without any order, causing inconvenience and blockage of the streets. Write an email to the local Secretary of the Resident's Association complaining against this problem.
- 13 (a) Comment briefly on different types of reports used for technical writing.
 (b) Draft a feasibility report on the establishment of a new restaurant "Quick-Service" at Secunderabad Railway Station Road. (Hints: Obtain Market Statistics, Evaluate Potential Locations, Review the Competition, Look at the Cost Structure and Evaluate Management Capability)
- 14 (a) What is a user manual? Why do we need it?
 (b) Bring out a few differences between product manual and operations manual.
- 15 (a) Discuss do's and don'ts of information transfer (Non-verbal to verbal and vice-versa)
 (b) Observe the following pie chart and prepare a write up of about 100 words describing the causes of 'Increasing Road Accidents'.



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- 16 (a) What aspects of visual presentation are important to make it effective?
- (b) Draw a flow chart restating the following procedure/information. Manuscripts prepared by students and teachers will be collected in order to be thoroughly screened. All necessary additions, alternations, omissions will be made. This shall help us prepare a rough draft. Then these manuscript along with a dummy shall be sent to the printer. The printer shall further proofread and correct the manuscript by a copy writer. Once corrected and proofread the manuscript shall be sent for final printing.
- 17 (a) Discuss briefly the ABC format that is commonly used in technical writing.
- (b) In an oral presentation, getting audience attention is crucial. Suggest ways/techniques that can be used to capture audience attention for effective presentation.

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FACULTY OF ENGINEERING
B.E. 2/4 (Civil) I-Semester (Backlog) Examination, July 2021

Subject : Mathematics – III (Common to All Except. ECE / I.T.)

Time: 2 hours

Max. Marks: 75

Note: Missing Data, if any, may be suitably be assumed.

PART – A

Answer any seven questions.

(7x3=21 Marks)

- 1 Form a partial differential equation by eliminating the arbitrary constants a and b from $z = (x - a)^2 + (y - b)^2$.
- 2 Solve $p^2 + q^2 = 1$.
- 3 Find b_1 in the Fourier series expansion of $f(x) = |\sin x|$ in $[-\pi, \pi]$.
- 4 Write one dimensional wave, heat equations and two dimensional Laplace equation.
- 5 If $f(x) = \begin{cases} \frac{x}{6} + k, & 0 \leq x \leq 3 \\ 0 & \text{elsewhere} \end{cases}$ is a probability density function of a continuous random variable, find k.
- 6 Find the expected value of the number of points obtained in a single throw with an ordinary die.
- 7 Define normal distribution.
- 8 Write the uses of χ^2 - test (chi-square test).
- 9 Find the normal equations to fit a straight line $y = ax + b$ for the following data:

x	-2	0	2	4	6
y	1	3	6	8	13
- 10 If one of the regression coefficients is greater than 1, show that the other regression coefficient is less than 1.

PART – B

Answer any three questions.

(3x18 = 54 Marks)

- 11 (a) Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$.
 (b) Using the transformations $x^2 = X$ and $y^2 = Y$, reduce the partial differential equation $2xyz = px^2y + qxy^2 + 4pq$ to Clairant's form and hence solve it.
- 12 (a) Find the Fourier series for $f(x) = x^3$ in $[-1, 1]$.
 (b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, which statistics the conditions $u(0, y) = u(\ell, y) = u(x, 0) = 0$ and $u(x, a) = \sin\left(\frac{n\pi x}{\ell}\right)$.

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13 (a) State and prove Baye's theorem.

(b) Find the moment generating function of the random variable x having the probability density function

$$f(x) = \begin{cases} x, & 0 \leq x < 1 \\ 2 - x, & 1 \leq x < 2 \\ 0 & \text{elsewhere} \end{cases}$$

14 (a) Find the mean and variance of Gamma distribution.

(b) Two independent samples of sizes 8 and 7 had the following values.

Sample A	11	11	13	11	15	9	12	14
Sample B	9	11	10	13	9	8	10	-

Is the difference between the means of samples significant?

(Give $t_{0.05} = 2.6$ for 13 d.f.)

15 (a) Fit least squares polynomial of degree 2 for the following data:

x	0	1	2	3	4
y	-4	-1	4	11	20

(b) Find the regression line of x on y for the following data:

x	5	7	8	10	11	13	16
y	33	30	28	20	18	16	9

16 Solve the partial differential equation.

$$px + qy + z - xq^2 = 0 \text{ by Charpit's method.}$$

17 (a) Find the Fourier cosine series for $f(x) = x^2$ in $[0, \pi]$.(b) If the coefficient of correlation between two variables x and y is 0.5 and the acute angle between their lines of regression is $\tan^{-1}\left(\frac{3}{8}\right)$, show that $\sigma_x = \frac{1}{2}\sigma_y$.

FACULTY OF ENGINEERING
BE III/IV (IT) I-Semester (Backlog) Examination, July 2021

Subject: Discrete Mathematics

Time: 2 Hours

Max .Marks: 75

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any seven questions.

(7x3=21 Marks)

- 1) Construct truth table for $[(p \vee q) \wedge (\sim r)] \leftrightarrow q$.
- 2) Write negation of "There is an integer x such that x is even and x is prime" by changing quantifier.
- 3) Write the De MORGAN's Laws.
- 4) Check whether the following relation is a function. Define R by xRy If $x^2 + y^2 = 1$ where x + y are real numbers such that $0 \leq x \leq 1, 0 \leq y \leq 1$
- 5) The recursive definition of the binomial co-efficients C(n,k) is $C(n,n) = 1, C(n,0) = 1$ and $C(n,k) = C(n-1,k) + C(n-1,k-1)$ If $n > k > 0$ then expand C(5,2) to express interms of quantifier defined by the basics.
- 6) Define partially ordered relation.
- 7) If $V = \{v_1 v_2 \dots v_n\}$ is the vertex of a non- directed graph then prove that $\sum_{i=1}^n \text{deg}(v_i) = 2|E|$.
- 8) What is an INCIDENCE matrix.
- 9) Define (a) POSET (b) Lattice
- 10) Define PRODUCT-OF-SUMS expansion

PART – B

Answer any three questions.

(3x18=54 Marks)

- 11) a) Check for tautology of the following $[(p \rightarrow q) \wedge (r \rightarrow s) \wedge (p \vee r)] \rightarrow (q \vee s)$
 b) Discuss the various methods of proving statements.
- 12) a) Use truth tables to verify the commutative law $p \vee q \Leftrightarrow q \vee p$
 b) How many 4 – digit numbers can be formed with ten – digits (0,1,2, ..., 9) if
 (i) Repetitions are allowed (ii) Repetitions are not allowed

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- 13) a) Find a recurrence relation and give initial condition for the number of bit string of length 'n' that do not have two consecutive 0's. How many such bit strings are there of length five.
- b) Solve $a_n - 4a_{n-1} + 4a_{n-2} = 3n + 2^n$ with $a_0 = 1, a_1 = 1$
- 14) a) Explain about conditional probability.
- b) What are the applications of INCLUSION-EXCLUSION.
- 15) a) State and prove five – color theorem.
- b) State and prove Euler's formula for connected planar simple graph.
- 16) List all ordered pairs in the relation $R = \{(a,b)/a \text{ divides } b\}$ on the set $\{1, 2, 3, 4, 5, 6\}$. Display the above relation in Graphical form
- 17) a) Prove that a tree with n- vertices has exactly 'n-1' edges
- b) Show that K_n is planar for $1 \leq n \leq 4$.

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FACULTY OF ENGINEERING
B.E. 2/4 I - Semester (ECE) (Backlog) Examination, July/August 2021

Subject: Applied Mathematics

Time: 2 Hours

Max. Marks: 70

PART – A

Note: Answer any five questions.

(5x2 = 10 Marks)

- 1 Obtain a partial differential equation by eliminating the arbitrary constants a,b from $z = (x - a)^2 + (y - b)^2$.
- 2 Solve $(y^2 + z^2)p - xyq + xz = 0$.
- 3 Show that $f(z) = |z|^2$ is not analytic at any point.
- 4 If $f(z) = u(x, y) + iv(x, y)$ is analytic at a point z then show that $|f'(z)|^2 = \begin{vmatrix} u_x & u_y \\ v_x & v_y \end{vmatrix}$.
- 5 Find the Taylor's series of $f(z) = \frac{1}{z-3}$ about $z = 4$.
- 6 Find the residue of $f(z) = \frac{1 - e^{2z}}{z^4}$ at its pole.
- 7 Using Newton-Raphson method, find an iterative formula to evaluate $N^{\frac{1}{q}}$ where $N > 0$, q is an integer.
- 8 Find the Lagrange interpolating polynomial which fits the following data:

x	-1	2
$f(x)$	8	29

- 9 Show that the angle between the two lines of regression is $\tan \theta = \frac{1 - \rho^2}{\rho} \frac{\sigma_1 \sigma_2}{\sigma_1^2 + \sigma_2^2}$ where σ_1, σ_2 are the standard deviations of X and Y respectively and ρ is the correlation coefficient.
- 10 Using the method of least squares fit a straight line to the following data.

x	-2	-1	0	1	2
y	1	2	3	3	4

PART – B

Note: Answer any four questions.

(4x15 = 60 Marks)

- 11 (a) Solve $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$.
- (b) Using Charpit's method, find the complete integral of $xp + 3yq = 2(z - x^2q^2)$.

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12 (a) Find the analytic function $f(z) = u(x, y) + iv(x, y)$ where $u(x, y) = x^2 - y^2 - y$.

(b) Evaluate $\int_c \frac{(z^4 - 3z^2 + 6)}{(z+i)^3} dz$ where c is the circle $|z| = 2$.

13 (a) Find the Laurent series of $f(z) = \frac{1}{(1-z)(z-2)}$ in the regions (i) $1 < |z| < 2$ and (ii) $|z| > 2$.

(b) Evaluate $\int_c \frac{4z^3 + 3}{(z-5)(z^2 + 4)} dz$ where c is the circle $|z| = 3$.

14 (a) Using Newton's forward interpolation formula, evaluate $f(4)$ from the following data.

x	0	1	2	3
$f(x)$	1	0	1	10

(b) Using Newton's divided differences formula, evaluate $f(5)$ from the following data.

x	0	1	2	4
$f(x)$	-5	-7	-1	59

15 (a) Fit a parabola $y = a + bx + cx^2$ to the following data.

x	1	2	3	4	5
y	6	17	36	63	98

(b) The coefficient of rank correlation of the marks obtained by 10 students in Mathematics and Statistics was found to be 0.5. It was later discovered that the difference in ranks in two subjects obtained by one of the students was wrongly taken as 3 instead of 7. Find the correct coefficient of rank correlation.

16 (a) With $h=1$, evaluate $(\Delta + \nabla)^2(x^2 + x)$.

(b) Using Runge-Kutta fourth order method evaluate $y(2.2)$ if $y' = x(y - x)$, $y(2) = 3$ with $h = 0.2$.

17 (a) Evaluate $\int_c (\bar{z})^2 dz$ where c is the straight line joining $O(0,0)$ and $A(9,3)$.

(b) Find the bilinear transformation which maps the points $1, 0, -1$ onto the points $i, 1, \infty$ respectively.
