Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CE2105

II B.Tech I Semester Supple Examinations, May-2023

FLUID MECHANICS

(CE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Determine the minimum size of glass tubing that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.25 mm. Take surface tension of water in contact with air as 0.0735 N/m.

   (b) Define the following: (i) Atmospheric pressure, (ii) Gauge pressure, (iii) Vacuum pressure, and (iv) Absolute pressure.

   (c) Define stream line and path line.

   (d) Differentiate between free vortex and forced vortex.

   (e) What are the advantages of triangular notch over a rectangular notch.

   (f) What is an equivalent pipe?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Explain Newton's law of viscosity and classify different types of fluids.

   (b) What do you mean by surface tension? If the pressure difference between the inside and outside of the air bubble of diameter 0.01 mm is 29.2 kPa, what will be the surface tension at air-water interface?

3. (a) State and derive Pascal's law.

   (b) An annular plate 2m external diameter and 1m internal diameter with its greatest and least depths below the surface being 1.5 m and 0.75 m respectively. Calculate the magnitude, direction and location of the force acting upon one side of the plate due to water pressure.

4. (a) Derive continuity equation in three dimensional cartesian coordinate system.

   (b) If $\varphi = 3xy$, find x and y components of velocity at (1, 3) and (3, 3). Determine the discharge passing between stream lines passing through these points.

5. (a) Derive the expression for discharge through a venturimeter.

(b) 250 litres/sec. of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135°, find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400 kN/m^2. Take specific weight of water as 9.81 kN/m^3.

6. (a) Find an expression for the discharge over a Cipolletti weir?

(b) A large tank has a sharp-edged circular orifice of 930 mm^2 area at a depth of 3 m below constant water level. The jet issues horizontally and in a horizontal distance of 2.4 m, it falls by 0.53 m, the measured discharge is 4.3 lit/s. Determine coefficients of velocity, contraction and discharge for the orifice.

7. (a) Explain pipes in series and pipes in parallel.

(b) A horizontal pipe of 100 mm diameter is joined by sudden enlargement to a 150 mm diameter pipe. Water is flowing though it at the rate of 2 m^3 /min. Find: (i) Loss of head due to abrupt expansion, (ii) Pressure difference in two pipes, and (iii) Change in pressure if the change of section is gradual, without any loss.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CE2106

II B.Tech I Semester Supple Examinations, May-2023

MECHANICS OF SOLIDS

(CE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) State Saint Venant's principle.
   (b) Define: Maximum principal stress theory.
   (c) What is shear force and bending moment diagram?
   (d) Write the theory of simple bending equation.
   (e) Mention the assumptions followed in Euler's theory.
   (f) Why hollow circular shafts are preferred when compared to solid circular shafts?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. A reinforced concrete column 50 cm x 50 cm in section is reinforced with 4 steel bars of 2.5 cm diameter, one in each corner. The column is carrying a load of 2000 kN. Find the stresses in the concrete and steel bars. Take modulus of elasticity of steel and concrete as 2.1 x 10^5 N/mm^2 and 1.4 x 10^4 N/mm^2 respectively.

3. A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 on the plane at right angle to the former. Each of the above stress is accompanied by a shear stress of 63 N/mm^2. Find (i) The direction and magnitude of each of the principal stress (ii) Magnitude of greatest shear stress.

4. A simply supported beam of length 10 m carries the UDL and two-point loads as shown in the figure 1. Draw the shear force and bending moment diagrams for the beam.

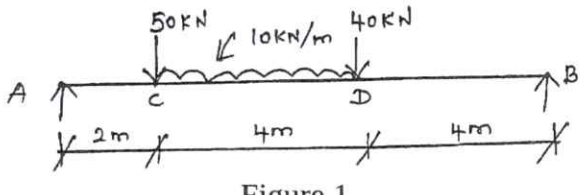

Figure 1

5. (i) A rectangular beam 300 mm deep is simply supported over a span of 4 m. What UDL the beam may carry, if the bending stress is not to exceed 120 Mpa. Take I = 225 x 10^6 mm^4.

(ii) A timber beam of rectangular section supports a load of 20 kN uniformly distributed over a span of 3.6 m. If the depth of the beam section is not to exceed 7 Mpa. Find the dimension of the beam section.

6. A hollow C.I column whose outside diameter is 200 mm has a thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 4. Calculate the slenderness ratio and the ratio of Euler's and Rankine's critical loads. For cast iron, fe =550 $N/mm^2$and E = $8x10^4$ N/mm^2.

7. A thin cylindrical shell 3 m long has 1m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also the change in the dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm^2. Take E = $2x10^5$ N/mm^2 and poison's ratio = 0.3. Also calculate change in volume.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EE2103

II B.Tech I Semester Supple Examinations, May-2023

ELECTRO MAGNETIC FIELDS

(EEE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Specify the applications of Gauss Law.
   (b) Distinguish between conduction current and convection current.
   (c) State Ampere's Circuit Law.
   (d) What is the inductance of toroid for the coil of N turns?
   (e) Define torque and write its expression.
   (f) What is the importance of Poynting vector?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Define Coulombs law. What is its proportionality constant K in free space? [6]
   (b) Two 6nC point charges are located at (1,0,0) and (-1,0,0) in free space. i) Find V at P (0,0,z) ii) Find V_{max} iii) Find $\left|\frac{dv}{dz}\right|$ on the z-axis. [6]

3. (a) Derive an expression for capacitance of co-axial cable. [6]
   (b) In a material which $\sigma = 5.0\,s/m$ and $\epsilon_r = 1$, the electric field intensity is $E = 250\sin 1010t\left(\frac{V}{m}\right)$. Find the conduction and displacement current densities. [6]

4. Derive the boundary conditions for magnetostatic fields at the interface of two different medium with permeability μ_1 and μ_2. [12]

5. (a) Derive the expression for Vector magnetic potential, which satisfies Vector Possion's equation. [6]
   (b) Determine the inductance of a solenoid of 2500 turns wound uniformly over a length of 0.25m on a cylindrical paper tube, 4 cm in diameter and the medium is air. [6]

6. (a) Find the magnetic field intensity due to a straight current carrying filament. [6]
   (b) Find the magnetic field intensity at the centre of O of a square loop of sides equal to 5m and carrying 10A of current. [6]

7. (a) Write Maxwell's equations in integral form for time varying fields. [6]
   (b) Generalize Ampere's law for time varying fields. [6]

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EE2105

II B.Tech I Semester Supple Examinations, May-2023

COMPLEX VARIABLES AND STATISTICAL METHODS

(EEE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1.

(a) If $f(z)=u(x,y)+iv(x,y)$ be differentiable at a point then find the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$.

(b) Determine and classify the singular points of 1/Z

(c) Evaluate $\int_C tanzdz$ where C is $|z|=2$.

(d) The power W dissipated in a resistor is proportional to the square of the voltage V. That is, $W=rV^2$, where r is a constant. If $r=3$, and V can be assumed to be a normal variable with mean 6 and standard deviation 1, find expectation $E[W]$.

(e) Let $X_1, X_2, X_3,\ldots, X_n$ be a random sample of size n from the population represented by X. Find the variance of sample mean $\acute{X}$.

(f) Define Type I and Type II errors.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2.

(a) Prove that the function $f(z)=\begin{cases}\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & if\ z\neq 0\\ 0\ if\ z=0\end{cases}$ satisfies the Cauchy-Riemann equations at the origin but $f'(0)$ does not exist.

(b) Given the function $w=z^3$ where $w=u(x,y)+iv(x,y)$. Show that u and v satisfy the Cauchy-Riemann equations. Prove that the families of curves $u=c_1$ and $v=c_2$ are orthogonal to each other. Where c_1 and c_2 are constants.

3.

(a) Evaluate $\int_C \frac{e^z}{(z+2)(z+1)^2}dz$ where C is $|z|=3$.

(b) Find the Laurent's series expansion of the function $\frac{z^2-1}{(z+2)(z+3)}$ valid in the annular region $2<|z|<3$.

4.

(a) Evaluate $\int_C \frac{(2z+1)^2}{4z^3+z} dz$ where C is the circle $|z|=1$ using residue theorem.

(b) Prove that $\int_0^\infty \frac{1}{x^6+1} dx = \frac{\pi}{3}$

5.

(a) A hospital is known for coronary artery bypass grafting. Let X be the number of such surgeries done on a given day. The following table gives the probability distribution of the random variable X:

$X=x$	0	1	2	3	4	5
$p(x)$	0.02	0.05	0.10	0.15	0.18	0.50

(i) $P(X \leq 2)$ (ii) $P(2<X<5)$ (iii) $P(X \geq 2)$ (iv) $P(1 \leq X \leq 4)$

(b) Let X be an exponential random variable with parameter λ. Calculate mean and variance of X.

6.

(a) Suppose that X is a random variable with mean μ and variance σ^2. Let $X_1, X_2, X_3, \ldots, X_n$ be a random sample of size n from the population represented by X. Show that the sample mean $\dot{x}$ and sample variance S^2 are unbiased estimators of μ and σ^2 respectively. Also find the standard error of the sample mean.

(b) A manufacturing engineer decided to check the efficiency of a new technician hired by the company. She records the time taken by the technician to complete 100 randomly selected jobs and found that in this sample of 100, the average time taken per job was 10 hours with a standard deviation of two hours. Find a 95% confidence interval for μ, the average time taken by a technician to complete one job.

7.

(a) Write the procedure for testing of Hypothesis.

(b) The mean weight obtained from a random sample of size 100 is 64 gms. The S.D of the weight distribution of the population is 3 gms. Test the statement that the mean weight of the population is 67 gms at 5% level of significance. Also set up 99% confidence limits of the mean weight of the population.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME2101

II B.Tech I Semester Supple Examinations, May-2023

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What is meant by a bilateral circuit?
(b) Draw the output wave form of voltage of a DC generator without commutator?
(c) Draw the primary winding circuit diagram of the transformer?
(d) Write short notes on the slip of an induction motor?
(e) What is meant by a rectifier?
(f) What is meant by a linear IC?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Deduce the equivalent nose to tail connection of three resistors connected at a common point?
(b) Derive the equivalent capacitance of a series network having 4 equal capacitances?

3. (a) Draw the diagram and explain the functions of field poles in the DC machines?
(b) Derive the expression for the rotational force of a DC motor?

4. (a) Obtain the output emf expressions of primary and secondaries windings of the transformer?
(b) A 3600/220V, 50Hz, single phase transformer has per turn emf of about 9 volt and maximum flux density of 1.6 wb/m^2. Find the number of high voltage and low voltage turns and the net cross sectional area of the core?

5. (a) Explain in detail about the principle of operation of synchronous generator?
(b) A 3 phase, 50Hz induction motor has a full load speed of 970 r.p.m. Find the slip, number of poles, frequency of rotor induced emf, the speed of the rotor field with respect to the structure of the rotor, the speed of the rotor field with respect to the stator structure and the speed of the rotor field with respect to the stator field?

6. (a) Draw the circuit diagram and explain the operation of single stage CE amplifier?
(b) Explain in detail about the characteristics of PN junction diode and its conduction mode of operation?

7. (a) Discuss in detail about the characteristics of op-amps along with the symbol?
(b) Obtain the output expression of the differentiator circuit using the op-amp?

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME2104

II B.Tech I Semester Supple Examinations, May-2023

FLUID MECHANICS

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Explain the effect of temperature on the dynamic viscosity of water and that of air.

(b) Distinguish between streamline and pathline.

(c) Write down the assumptions under which $\frac{p_1}{\rho g}+\frac{V_1^2}{2g}+z_1=\frac{p_2}{\rho g}+\frac{V_2^2}{2g}+z_2$ (where p is the pressure, ρ is the density, V is the velocity, z is the elevation, g is the acceleration due to gravity) is applicable between any two points 1 and 2 in the flow field.

(d) State Buckingham's π theorem

(e) Consider steady, laminar, incompressible and fully developed flow of water with constant properties between two infinitely long parallel plates. Sketch the velocity and shear stress distribution across a section.

(f) Differentiate between form drag and surface drag.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) State and explain Newton's law of viscosity. A circular disc of radius R is kept at a small height h above a fixed bed by means of a layer of oil of dynamic viscosity, μ. If the disc is rotated at an angular velocity, ω, obtain an expression for the viscous torque on the disc. Assume linear variation of velocity within the oil film.

(b) What is a manometer? How are they classified? Describe with a neat sketch how the difference of pressure at two points of a pipe can be measured with the help of a differential manometer and derive the required equation.

3. (a) Determine the velocity and acceleration of fluid particle at (1,2,3) and t = 0.1s for the velocity field given by V=3x^3 ^i+10xy ^j+4y ^k.

(b) For a three-dimensional incompressible flow, derive the continuity equation in differential form.

4. (a) Derive Euler's equation of motion along a streamline for steady flow.

(b) At a certain location A of a pipe line carrying an oil of density 850 kg/m^3, the diameter is 80 cm, the pressure is 180 kN/m^2 and the average velocity is 5 m/s. At another section B which is 3 m higher than A, the diameter is 50 m and the pressure is 100 kN/m^2. What is the direction of flow?

5. (a) Define and give significance of Reynolds number and Mach number.

(b) The resistance F of a ship is a function of its length L, velocity V, acceleration due to gravity g and fluid properties like density, ρ and viscosity, μ. Using dimensional analysis, show that the resistance is given by $F=\rho V^2L^3\, f(gl/V^3, \mu/\rho ND^3)$

6. (a) Mention two most important characteristics of turbulent flow. List the causes of minor energy losses in flow through pipes. "For the laminar flow regime, the friction factor is independent of relative roughness of the pipe"- Explain why?
(b) Water at 20°C flows through a 30 mm diameter pipe. The flow is steady, incompressible and fully developed. The loss of head due to fluid friction over a 20 m length of pipe is 1.8 m. Determine (i) the average velocity of flow, (ii) the volumetric flow rate, (iii) the wall shear stress, and (iv) the Darcy's friction factor. Viscosity of water at 20°C is 0.001 Pa-s.

7. (a) What is meant by boundary layer thickness, displacement thickness and momentum thickness? What are the factors that influence the total drag on a body?
(b) Find the ratio of momentum thickness to displacement thickness for a linear distribution of velocity $\frac{u}{u_\infty}=\frac{y}{\delta}$ in the boundary layer on a flat plate, where δ is the boundary layer thickness and u_∞ is the free stream velocity?

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16ME2105

II B.Tech I Semester Supple Examinations, May-2023

THERMODYNAMICS

(ME)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

(a) Define zeroth law of thermodynamics?

(b) Define first law of thermodynamics for a closed cycle?

(c) State Clausius inequality?

(d) Define pure substance?

(e) State Dalton's law of partial pressures?

(f) Draw p-v and T-s diagram of Dual cycle?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Show that work is a path function not a property.

(b) A gas expands from an initial state where the pressure is 340 kPa and the volume is 0.0425 m^3 to a final pressure of 136 kPa. The relationship between the pressure and volume of the gas is pv^2= constant. Determine the work for the processes and draw p-v diagram of the processes.

3. (a) Prove that energy is a property of a system.

(b) A mixture of gases expands at constant pressure from 1 MPa, 0.03 m^3 to 0.06 m^3 with 84kJ positive heat transfer. There is no work other than that done on a piston. Find ΔE for the gaseous mixture. The same mixture expands through the same state path while a stirring device does 21kJ of work on the system. Find ΔE, W and Q for the process.

4. (a) Derive Maxwell relations?

(b) A refrigeration plant for a food store operates with a COP which is 40% of the ideal COP of a Carnot refrigerator. The store is to be maintained at a temperature of -5°C and the heat transfer from the store to the cycle is at the rate of 5 kW. If the heat is transferred from the cycle to the atmosphere at a temperature of 25°C, calculate the power required to drive the plant and the heat discharged to the atmosphere.

5. (a) Explain the phase equilibrium diagram for a pure substance on h-s plot with relevant constant property lines and a neat sketch

(b)A rigid closed tank of volume 3 m^3 contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until steam becomes dry saturated. Determine the final pressure and the heat transfer to the tank.

6. (a)Derive the equations used for computing the entropy change of an ideal gas
   (b) A constant volume chamber of 0.3 m^3 capacity contains 1 kg of air at 5°C. Heat is transferred to the air until the temperature is 100°C. find the work done, the heat transferred, and the changes in internal energy, enthalpy and entropy.

7. (a) Explain the working of Diesel cycle and derive the expression for thermal efficiency.
   (b) An engine working on the Otto cycle is supplied with air at 0.1 MPa, 35°C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency, and the mean effective pressure. (for air c_p= 1.005, c_v= 0.718 and R=0.287 kJ/kg)

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Narasaraopeta Engineering College (Autonomous)
Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EC2102

II B. Tech I Semester Supple Examinations, May-2023

ELECTRONIC DEVICES AND CIRCUITS

(ECE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**
Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B
All questions carry equal marks of 12.

PART-A

1. (a) Write the relation between mobility and Hall coefficient?
   (b) Sketch V-I characteristics of a PN diode for the following conditions: $R_f = 0$, $R_r = 0$, $V_\gamma = 0$
   (c) What are the characteristics of LEDs?
   (d) Draw the output characteristics of NPN transistor in CE configuration?
   (e) Why biasing is necessary in BJT amplifiers?
   (f) Draw the small signal model of FET as a common source amplifier?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) What is Fermi level? Prove that the Fermi level is lies exactly in between conduction band and valance band of intrinsic semiconductor.
   (b) The following data are given for an intrinsic Ge at 300K. Calculate the conductivity and resistivity of the sample? ($n_i = 2.4 \times 10^{19} m^{-3}$, $\mu_e = 0.39\ m^2\text{-}V^{-1}\ S^{-1}$, $\mu_p = 0.19\ m^2\text{-}V^{-1}\ S^{-1}$).
3. (a) Explain the concept of diode capacitance. Derive expression for transition capacitance?
   (b) Sketch the V-I characteristics of p-n junction diode for forward bias voltages. Analyze between the incremental resistance and the apparent resistance of the diode?
4. (a) Draw the circuit of bridge rectifier and explain its operation with the help of input and output waveforms?
   (b) Explain the operation of L-section filter and derive expression for ripple factor? (FWR)
5. (a) Explain the constructional details of Bipolar Junction Transistor?
   (b) Define Early-effect; Explain why it is called as base-width modulation? Discuss its consequences in transistors in detail?
6. (a) Draw the self-bias circuit and obtain the expression for the stability factor. Discuss the advantages and disadvantages of self-biasing?
   (b) Define Thermal Runaway in transistors? Derive the condition to prevent Thermal Runaway in Bipolar Junction Transistors?
7. (a) Explain the operation of FET with its characteristics and explain the different regions in transfer characteristics?
   (b) Give the construction details of UJT & explain its operation with the help of equivalent circuits?

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Subject Code: R16EC2103

II B.Tech I Semester Supple Examinations, May-2023

SIGNALS AND SYSTEMS

(ECE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Define deterministic and random signals?
   (b) State any two properties of Fourier series?
   (c) State and prove the duality property of Fourier Transform?
   (d) What is the condition for causality in terms of z-transform?
   (e) Define aliasing and what are the effects of aliasing?
   (f) State any two properties of autocorrelation function?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Determine whether the following systems are: i) Memoryless, ii) Stable iii) Causal iv) Linear and v) Time - invariant. (i) $y(n) = nx(n)$ (ii) $y(t)= e^{x(t)}$
   (b) Given the following signals (i) $u(t)-u(t-5)$ (ii) $e^{5t}\,u(t)$.
   Identify energy signal and power signal and calculate their energies and their average power.
3. (a) Determine the Fourier series coefficient of $\cos(4\pi t)$.
   (b) Consider a casual LTI system whose input x(t) and output y(t) are related with the following differential equation: $\frac{d}{dx}y(t)+4y(t)=x(t)$. Find the Fourier series representation of the output y(t) with $x(t) = \cos(2\pi t)$.
4. (a) Find the Fourier transform of the gate function.
   (b) State and prove the Modulation property of FT and what is meant by self-reciprocal with respect to FT?
5. (a) Find the system function and the impulse response of the system described by the difference equation $y(n) = x(n)+2x(n-1)-4x(n-2)+x(n-3)$.
   (b) Consider the signal $x(t) = 3e^{2t}u(t) + 4e^{3t}u(t)$. Determine the Laplace transform X(s) of x(t). Sketch the location of the poles and zeros of X(s) and the ROC.
6. (a) A signal $x(t) = \text{sinc}(150\pi t)$ is sampled at a rate of a) 100 Hz, b) 200 Hz, and c) 300Hz. For each of these cases, explain if you can recover the signal x(t) from the sampled signal.
   (b) Define Nyquist rate and Nyquist interval. Find the Nyquist rate and Nyquist interval of Asinc (t).
7. (a) Derive the Parseval's theorem from the frequency convolution property.
   (b) What is the relation between power spectrum density and auto-correlation function.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EC2104

II B.Tech I Semester Supple Examinations, May-2023

CONTROL SYSTEMS

(ECE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A **[2+2+2+2+2+2]**

1.	(a)	Define Control system.	2M
	(b)	How do you reverse the direction of rotation in AC servomotor?	2M
	(c)	What are the standard test signals used in time domain analysis?	2M
	(d)	When does the procedure for making the Routh array gets terminated.	2M
	(e)	Why bode plots are commonly used in the frequency domain design?	2M
	(f)	What is the need of lag-lead compensator?	2M

PART-B

4 X 12 = 48

2.	(a)	What is the classification of control systems and discuss the importance of mathematical modelling of a control system.	6M
	(b)	Explain the necessity and effect of feedback in control systems?	6M
3.	(a)	Derive the transfer function and develop the block diagram of Armature controlled DC servo motor.	6M
	(b)	State and explain the Mason's gain formula.	6M
4.	(a)	A unity feedback system is characterized by the open loop transfer function $G(s)=\frac{1}{s(1+0.3s)(1+0.4s)}$. Determine the steady state error for unity step, unity ramp and unity acceleration inputs. Also determine the damping factor and natural frequency of dominant roots.	6M
	(b)	Define the steady state error and error constants of different types of inputs.	6M
5.	(a)	Explain the construction rules for root locus technique.	4M
	(b)	Test the stability of the system with the following characteristic equation by Routh's test $s^6 + 2s^5 + 8s^4 + 20s^2 + 16s + 16 = 0$.	8M

6.	(a)	Determine the resonant frequency ω_r , resonant peak M_P and bandwidth for the system whose transfer function is $G(j\omega)=\frac{5}{5+j2\omega+(j\omega)^2}$.	6M
	(b)	Discuss the calculation of gain crossover frequency and phase crossover frequency with respective to the polar plots.	6M
7.	(a)	Explain the concepts of state, state variables and state model	6M
	(b)	Discuss the concept of controllability and observability with an example.	6M

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16EC2106

II B.Tech I Semester Supple Examinations, May-2023

ELECTRICAL AND MECHANICAL TECHNOLOGY

(ECE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) State the basic parts of a DC machine?
   (b) Define slip of an Induction motor?
   (c)What are the classifications of measuring instruments?
   (d)Explain the term 'Forging'?
   (e) What is the Radiation Intensity?
   (f) What is a worm and worm wheel?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) What are the different types DC generators? Draw the circuit diagrams? **[6M]**
   (b) From first principles, derive the EMF equation of a transformer? **[6M]**

3. (a) Explain the principle of working of a three phase Induction motor? **[6M]**
   (b) Draw the slip-torque curves of a three phase slip ring induction motor? **[6M]**

4. Explain the Construction of CRO? **[12M]**

5. Discuss the following a) Arc welding b) Resistance welding c) Gas welding **[4M+4M+4M]**

6. (a) What are the parameters of Heat transfer? **[6M]**
   (b) Explain the Black body radiation? **[6M]**

7. Briefly discuss the various types of belts used for the transmission of power? **[12M]**

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS2102

II B.Tech I Semester Supple Examinations, May-2023

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(CSE)

Time: 3 hours Max Marks: 60

Question Paper Consists of Part-A and Part-B.

Answering the question in Part-A is Compulsory &Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
   (b) Show that r is a valid reference from the following premises p-> q ,q-> r and p
   (c) Define tabular form and set builder form of sets with example
   (d) Define the following terms (i) path (ii) cycle
   (e) Find n if i) P(n,2)=72 ii) P(n,4) = 42p(n,2)
   (f) Let $a_n=2^n+5(3^n)$, for n = 0, 1, 2, ….. Find a_0,a_1 a_3 and a_4

[2+2+2+2+2+2]

PART-B

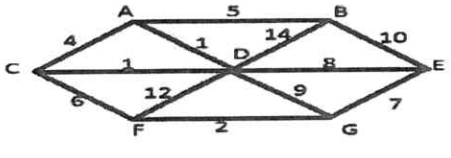
4 X 12 = 48

2. (a) Prove that $p \rightarrow (q \rightarrow r) \Leftrightarrow (p \wedge q) \rightarrow r$. [6 M]
   (b) Construct the truth table for the following statement $(\sim P \wedge \sim Q) \vee (Q \wedge R)$ [6 M]

3. (a) Show that r v s follows from the premises
   c v d, (c v d) ∧ ~h , ~h ∧ (a ∧ ~b), (a ∧ ~b), (r V s) [6 M]
   (b) Using the principle of mathematical induction,
   prove that $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \ldots + n(n+1) = (1/3)\{n(n+1)(n+2)\}$. [6 M]

4. (a) Let x = {1, 2, 3, … 7} and R = {(x, y) / x – y is divisible by 3} Show that R is an equivalence relation. [6 M]
   (b) Let f:Z→ N be a function defined by, f(x)= $\begin{cases} 2x-1, if\ x>0 \\ -2x\ if\ x\leq 0 \end{cases}$ [6 M]
   i. Prove that f is one-to-one and onto (b) determine f^{-1}
   ii. Given that, f(x)= 2x-1 if x>0
   =-2x if x≤0.

5. (a) Construct the minimal cost spanning tree for the cities shown in above graph using Prim's algorithm? [6 M]



(b) Show that maximum number of edges in simple graph with n vertices n(n-1)/2. [6 M]

6. (a) i. Explain the Pigeonhole principle? Prove that if any 30 people are selected, then we may choose a subset of 5 so that all 5 were born on the same day of the week. [6 M]

(b) For all x, y in a Boolean algebra B, [6 M]

(i) $(xy)'=x' \vee y'$ (ii) $(x \vee y)'=x' \wedge y'$

7. (a) Solve $a_n + 3a_{n-1} - 10a_{n-2} = 0$, $n \Rightarrow 2$, given $a_0 = 1$, $a_1 = 4$ using generating functions. [6 M]

(b) Solve the recurrence relation $a_n - 4a_{n-1} + 3a_{n-2} = 0$ for $n \geq 2$ with initial conditions $a_0 = 2$ and $a_1 = 4$. [6 M]

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS2103

II B.Tech I Semester Supple Examinations, May-2023

JAVA PROGRAMMING

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What is an Object? How it is different from a normal variable?
   (b) Differentiate between dynamic memory allocation and static memory allocation.
   (c) Define an Abstract class and list any two uses of an Abstract class.
   (d) List any four functions in Thread class.
   (e) Define the concept of event handling in java.
   (f) Why Swing components are referred as light weight components?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) List and Explain the advantages of Object-Oriented Programming over procedural programming. [6M]
   (b) List and Explain the features of Java programming language. [6M]

3. (a) Write a Java program to find whether the given number is prime or not. [6M]
   (b) Write a Java program to illustrate Method Overloading and constructor overloading. [6M]

4. (a) Explain various Access modifiers in Java with suitable examples. [6M]
   (b) What is an Exception? Create a user defined exception in Java. [6M]

5. (a) Write a program in java that creates two different threads, one for printing 1 to 100 numbers and the other for printing 101 to 200 numbers. [6M]
   (b) Discuss about thread synchronization. [6M]

6. (a) Explain Applet lifecycle and the functions involved at each stage of life cycle. [6M]
   (b) Discuss about various types of events and the corresponding listeners. [6M]

7. (a) Explain about any two Layout Managers with example programs. [6M]
   (b) Write syntax for creating and using various components in Swing package. [6M]

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS2104

II B.Tech I Semester Supple Examinations, May-2023

DATA STRUCTURES

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Define Time Complexity with an example.
   (b) Give the time complexity of quick sort.
   (c) Define stack with an example.
   (d) Write the advantages and disadvantages of double linked lists.
   (e) What is the significance of balance factor in AVL Tree
   (f) what are the different ways of representing a graph ?

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Define Data structure. Explain various operations on data structures.
   (b) Write the pseudocode for GCD of two numbers.

3. (a) Apply heap sort on set of any ten elements and explain its working principle.
   (b) Trace the steps of recursive merge sort algorithm to sort the following elements: 12, 25, 5,9, 1, 84, 63, 7, 15, 4, 3.

4. (a) Write an algorithm to insert and delete a key from a circular queue.
   (b) Discuss various applications of queues.

5. (a) Illustrate an algorithm to insert new node at the beginning, at middle position and at the end of a singly linked list.
   (b) Write an algorithm for polynomial addition using linked list.

6. (a) What operations can be performed on binary trees? Discuss.
   (b) Write in-order, pre-order and post-order traversal of a binary tree.

7. (a) What are connected components of graph? Is there any method to find out all the Connected components of graph? Explain.
   (b) Discuss Kruskal's algorithm with an example.

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS2105

II B.Tech I Semester Supple Examinations, May-2023

COMPUTER ORGANIZATION

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) Draw the block diagram of Binary Adder.
   (b) How a Fetch phase works explain with a neat diagram.
   (c) Define CISC. What are the characteristics of CISC.
   (d) What are the differences between virtual address and physical address.
   (e) Explain polling procedure.
   (f) Explain about Divide Overflow.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. Discuss about Logic microoperations with its applications.

3. (a) Explain all memory reference instruction with example. [6M]
   (b) Explain all computer registers with a common bus system. [6M]

4. (a) Define stack. Explain computer memory with stack segments [6M]
   (b) Define Effective Address (EA)? Discuss any four addressing modes with numerical example? [6M]

5. (a) Explain set associative mapping. [6M]
   (b) Explain the following applications: [2+2+2]
   i) ROM ii) PROM iii) EPROM

6. (a) Explain about Asynchronous serial transfer [6M]
   (b) Explain about Priority interrupt concept? [6M]

7. (a) Explain floating point representation with an example? [6M]
   (b) Perform the following arithmetic operations with the decimal numbers using signed 10's complement [3M + 3M]
   i) (-638)+(+785) ii) (-638)-(+785)

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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS2106

II B.Tech I Semester Supple Examinations, May-2023

FORMAL LANGUAGES AND AUTOMATA THEORY

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1.

(a) Write the mathematical representation of a Finite State Machine.

(b) Write the various operations that can be performed on languages.

(c) Define DFA and NFA.

(d) State Arden's Theorem.

(e) Define Chomsky Normal Form.

(f) Define Turing Machine.

[2+2+2+2+2+2]

PART-B

4 X 12 = 48

2. (a) Design a Finite State Machine that accepts strings in L such that integer number 'a' when represented as binary form is divisible by 5. 8 M

(b) Discuss in brief the advantages and disadvantages of a finite state machine. 4 M

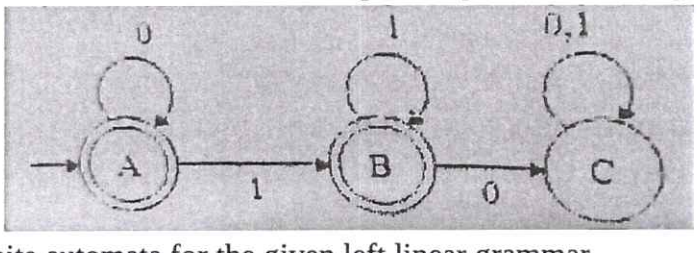
3. (a) What language does the following unrestricted grammar derive

$S \rightarrow S_1B$, $S1 \rightarrow aS_1b$, $bB \rightarrow bbbB$, $aS_1b \rightarrow aa$, $B \rightarrow \varepsilon$ 9 M

(b) Define Grammar. List the different types of grammar with their productions. 3 M

4. Construct a ε- NFA for $\sum=\{0, 1, 2\}$ that accepts a string contains any number of 0's followed by any number of 1's followed by any number of 2's. Also convert ε- NFA to DFA. 12 M

5. (a). Use Arden's theorem to construct the regular expression for the given DFA. 6 M



(b) Construct finite automata for the given left linear grammar. 6 M

$A \rightarrow Ba \mid Ab \mid b$, $B \rightarrow Ca \mid Bb$, $C \rightarrow Aa \mid Cb$

6. (a) Convert the following grammar to Greibach Normal Form. 6 M

$S \rightarrow XA \mid BB$, $A \rightarrow a$, $X \rightarrow b$, $B \rightarrow b \mid SB$

(b) Design a push down automata to accept all strings generated by the language. 6 M

$L = \{ WW^R / W \varepsilon \{a, b\}^* \}$

7. Construct a Turing Machine for the language, $L = \{a^n b^n c^n \mid n \geq 1\}$ 12 M

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