AR20

CODE: 20CET207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech. II Semester Regular Examinations, July, 2022

GEOTECHNICAL ENGINEERING

(Civil Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.	a)	Define Porosity and Void ratio. Derive the relation between void ratio and porosity	5M	CO1	I
	b)	Develop the grain size distribution curve for uniformly graded, well graded and gap graded soils and discuss their characteristics.	5M	CO1	II
		(OR)			
2.	a)	A partially saturated soil has a bulk density of 15.6 kN/cu.m and a water content of 20 %. If the specific gravity of solids is 2.6 and unit weight of water is 10kN/cu.m. Determine the degree of saturation, void ratio and water content at full saturation.	5M	CO1	V
	b)	Explain the salient features of Indian Standard Classification System.	5M	CO1	III
		UNIT-II			
3.	a)	Define Darcy's Law and what are the Factors affecting permeability of soil	5M	CO2	II
	b)	In a flow net the number of flow channels is 4 and the number of equipotential drops is 14. Given that the coefficient of permeability is 3× 10-3 cm/sec, Determine the quantity of seepage under a head of 3 m.	5M	CO2	I
		(OR)			
4.	a)	It is observed that in 25 minutes 800 ml of water passes through a soil sample of 15 cm high and 75 cm2 cross section under a head of 120 cm. Determine the discharge velocity and coefficient of permeability. If on oven drying the sample weighs 0.0135 kN, compute the seepage velocity. Assume the specific gravity of solids as 2.70.	5M	CO2	V
	b)	What is quick sand? Derive an expression for critical hydraulic gradient. Why is quick sand condition more common in sandy soils?	5M	CO2	V
		UNIT-III			
5.	a)	Explain the total stress, neutral stress and effective stress.	5M	CO5	I
	b)	The surface of saturated clay deposit is located permanently below the body of water. The γ_{sat} =20kN/m^2 up 3m and γ_{sat}=19kN/m^2 remaining 5m. Calculate the inter granular pressure at a depth of 8 m below the surface of clay layer.	5M	CO5	II
		(OR)			
6.	a)	What is the role of effective stress in soil mechanics?	5M	CO5	I
	b)	The water table at a building site is at a depth of 6m below the ground surface. The soil strata has an average liquidity index of 0.75 and a L.L of 60% and P.L of 38%. Assume saturated soil conditions and a specific gravity of solids as 2.74. Calculate the effective stress at a depth of 9.0 m below ground level. Draw a profile of total, effective and neutral stresses to this depth.	5M	CO5	II

UNIT-IV

7. a) What is IS light compaction? Give its salient features. What is zero air void line? 5M CO4 I

   b) How does compaction improve engineering properties of soil. 5M CO4 V

(OR)

8. a) A proctor compaction test was conducted on a soil sample, and the following observations were made: 5M CO4 III

Water Content (%)	7.7	11.5	14.6	17.5	19.7	21.2
Mass of wet Soil (g)	1739	1919	2081	2033	1986	1948

If the volume of the mold used was 950 cm^3 and the specific gravity of soils grains was 2.65, make necessary calculations and construct, (i) compaction curve and (ii) 80% and 100% saturation lines.

   b) A normally consolidated clay layer of 10 m thickness has a unit weight of 20 kN/m³ and specific gravity 2.72. The liquid limit of the clay is 58%. A structure constructed on this clay increase the overburden by 10%. Estimate the ultimate consolidation settlement. There is no secondary compression. 5M CO4 V

UNIT-V

9. a) What are the assumptions made in Boussinesq formulas for stress distribution in soils? 5M CO3 I

   b) A point load of 100 kN acts on the ground surface. Using Boussinesq's analysis, find the maximum vertical pressure on a vertical plane at a distance of 2 meters from the loading. 5M CO3 II

(OR)

10. a) Develop an equation for Stress under a circular area from the Equation for stress under a point load using Boussinesq's Theory. 5M CO3 II

    b) Explain how Newmark's influence chart is constructed. Explain how it is used to find the increase in vertical stress. 5M CO3 II

UNIT-VI

11. a) Explain Mohr and Mohr-Coulomb theory. 5M CO6 II

    b) In an in-situ vane shear test on saturated clay, a torque of 35 Nm was required to shear the soil. The diameter of the vane was 50 mm and length 100 mm. Calculate the undrained shear strength of clay. The vane was then rotated rapidly to cause remoulding of the soil. The torque required to shear the soil in the remoulded state was 5 Nm. Determine the sensitivity 5M CO6 III

(OR)

12. a) Explain the types of shear tests available for determining the shear parameters and state their relative merits and demerits. 5M CO6 II

    b) Two drained tests are performed on the material. In the first test, the all-round pressure is 200 KNm^2 and failure occurs at an added axial stress of 600KN/m^2. In the second test all-round pressure is 350KN/m^2 and failure occurs at an added axial stress of 1050 KN/m^2. What values of C^1 and φ^1 correspond to these results? 5M CO6 I

AR20

CODE: 20EET207 SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, July, 2022

CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
	UNIT-I			
1.	a) For the mechanical system shown in fig. 1, determine the transfer function $\frac{Y_1(s)}{F(s)}$.	6M	CO1	L3

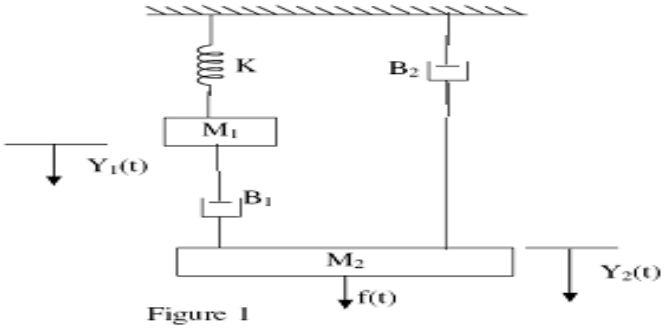
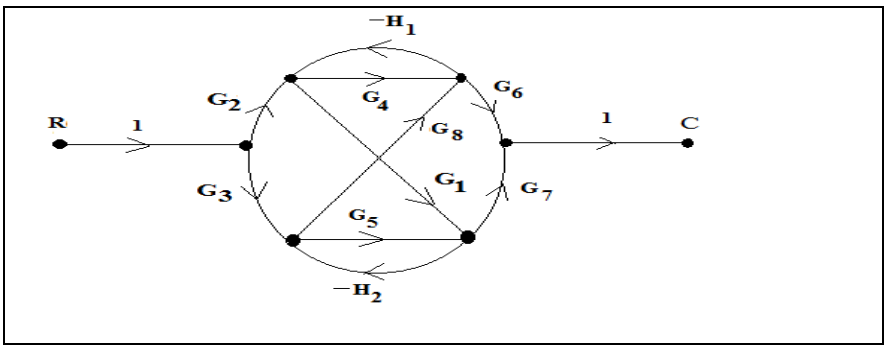


Figure 1

	b) Differentiate Open loop and Closed loop control systems.	4M	CO 1	L2
	(OR)			
2.	Find C/R for the system as shown in figure.	10M	CO 1	L3



	UNIT-II			
3.	a) Derive the transfer function of armature controlled DC servo motor	5M	CO 2	L2
	b) For a unity back system with open loop transfer function is given as, $G(s) = \frac{50}{(1+0.1s)(1+2s)}$ .Determine the position, velocity and acceleration error constants.	5M	CO 2	L3
	(OR)			
4.	a) Derive the transfer function of AC servo motor.	5M	CO 2	L3
	b) For a unity back system with open loop transfer function is given by, $G(s) = \frac{200}{S(S+10)}$ Determine: i) Maximum Overshoot ii) Rise Time iii) Steady state error if the input is a unit step.	5M	CO 2	L3

UNIT-III

5.	a)	Using Routh – Hurwitz criterion for the system determine the stability function. $S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$ i)Find the range of K for stability	5M	CO 3	**L3**
	b)	For a system with open loop transfer function $G(S) = \frac{K(S+1)}{(S+3)(S+4)(S+5)}$ Find the i) Angle of asymptotes ii) Break away point	5M	CO 3	**L3**

(OR)

6.		The open loop transfer function of a system is $G(s) = \frac{k}{s(s2+4s+8)}$ Draw the root locus and investigate the stability of the closed loop system. What is the value of K for which the system is marginally stable.	10M	CO 3	L4

UNIT-IV

7.		Given the open loop transfer function of a unity feedback $G(s) = \frac{1}{s(3+s)(1+2s)}$ system. Draw the Magnitude plot of Bode plot and measure the GM and PM.	10M	CO 4	L4

(OR)

8.	a)	Explain the concept of Gain margin and Phase margin in Bode plot.	5M	CO 4	L2
	b)	The open loop transfer function of a unity feedback system is, $G(s) = \frac{1}{s(1+s)(1+2s)}$ Sketch the polar plot of system and determine the gain margin and phase margin?	5M	CO 4	L3

UNIT-V

9.		Consider a unity feedback system with open loop transfer function $\frac{10}{s(s+1)}$ design a suitable compensator so that the compensated system has $K_v = 20\ sec^{-1}$ Phase margin = 50° Gain margin ≥10 db	10M	CO 5	L6

(OR)

10.		Discuss in detail about the procedural steps to design a phase lead compensator in frequency domain.	10M	CO 5	L2

UNIT-VI

11.	a)	The state equation of a system is given by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t), \quad t>0$ Compute the state transition matrix	6M	CO 6	L3
	b)	List out properties of state transition matrix	4M	CO 6	L3

(OR)

12.	a)	Derive the expression to obtain transfer function from state space representation.	5M	CO 6	L3
	b)	The state equations of the LTIV system are given by $y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ Find the solution for y(t) when unit step input is applied.	5M	CO 6	L3

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CODE: 20MET207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, July, 2022

STRENGTH OF MATAERIALS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.	a.	Explain clearly the different types of stresses and strains.	3	CO1	L2
	b.	Explain stress strain diagram of a mild steel and locate its salient points on it.	7	CO1	L2
		(OR)			
2.	a.	A steel rod 20 mm in diameter passes centrally through a steel tube of 25 mm internal diameter and 30 mm external diameter. The tube is 800 mm long and is closed by rigid washers of negligible thickness which are fastened by nuts threaded on the rod. Calculate the stresses in the tube and rod?	6	CO1	L3
	b.	Write the procedure to determine the thermal stresses in a composite bar?	4	CO1	L2
		UNIT-II			
3.		The intensity of loading on a simply supported beam of 5 m span of UDL 800 N/m entire length of the span. Draw the SF and BM diagrams	10	CO2	L3
		(OR)			
4.		What do you mean by point of conraflexure? A beam AC 7 m long is supported at the end A and its midpoint B. It carries a point load of 5000 N at C and UDL of 70 N/cm between A and B. Draw the SF and BM diagrams for the given beam and find the point	10	CO2	L3
		UNIT-III			
5.		Derive the equation of theory of pure bending? What are the assumptions made in the theory of bending?	10	CO3	L3
		(OR)			
6.	a.	Explain the term Strength of a section?	2	CO3	L2
	b.	A beam of I-section 60 cm deep and 30 cm wide has equal flanges 2.5 cm thick and web 1.5 cm thick. It carries a shear force of 300 kN at the cross-section. Determine the shear stress distribution in the beam and the ratio of maximum shear to mean shear. Also find the total shear force carried by the two flanges and the web.	8	CO3	L3
		UNIT IV			
7.		A solid steel shaft 2.4 m long of uniform circular section is fixed at one end and subjected to a twisting moment of 800 Nm (cw) at the free end and a twisting moment of 400 Nm (ccw) at distance of 1.6 m from the fixed end. Determine the required diameter of the shaft if the allowable shearing stress is limited to 60 MPa and the angle of twist at the free end is not to exceed 3^0. Take modulus of rigidity as 83 GPa	10	CO4	L3

(OR)

8.	a.	Derive from the first principles the expressions for longitudinal and circumferential stresses in thin cylinder closed at both ends and subjected to internal fluid pressure.	5	CO4	L2
	b.	A pressure vessel, which is made of steel is 2 m long, it is closed at both the ends and has an external diameter of 450 mm and is 10 mm thick. Find the increase of the external diameter and the increase of length when charged to an internal pressure of 1 MPa. Take E = 200 GPa and Poisson's ratio as 0.25.	5	CO4	L3

UNIT-V

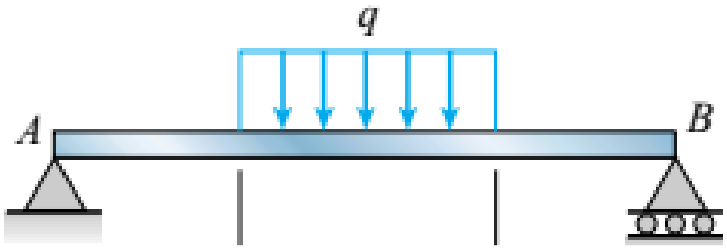
9.	a.	Explain the assumptions made in Euler's column theory. How far are these assumptions valid in practice?	4	CO5	L2
	b.	A bar of length 4 m, when used as simply supported beam subjected to a udl of 29.43kN/m over the entire span deflects by 15 mm at the centre. Determine the crippling loads, when it is used as column with following end conditions i. Both ends pin-joined ii.One end fixed and the other hinged iii. Both ends fixed	6	CO5	L3

(OR)

10.	a.	Rankine's formula is applicable for all lengths of column ranging from short to long columns	3	CO5	L2
	b.	A strut 2 m long has a tubular cross-section of 50 mm outside diameter and 44 mm inside diameter. Determine the Euler critical load when the ends are pinned. If the tube material has a yield stress in compression as 310 MPa, find the shortest length of the tube for which the Euler theory can be applied?	7	CO5	L3

UNIT-VI

11.		A beam of length 7m is simply supported at its ends. It carries a UDL (q) of 40kN/m for a span of 3 m at the equal distance from both ends as shown in the figure. Determine the deflection of the beam at its mid-point and also position of maximum deflection and value of maximum deflection. Take E=$2x10^5$ N/mm^2 and I= $4.3x10^8$$mm^4$	10	CO6	L3



(OR)

12.		Discuss the relationship between slope, deflection and radius of curvature.	10	CO6	L2

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CODE: 20ECT207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech. II Semester Regular Examinations, July 2022

TRANSMISSION LINES & ELECTRO MAGNETIC WAVES

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.		Derive the expression for the characteristic impedance of a transmission line in terms of its line parameters and state the conditions for Lossless line.	10	1	Analyzing
		(OR)			
2.		A distortionless line has Z_o= 60Ω, α= 20mNp/m, u=0.6c, where c is the speed of light in a vacuum. Find *R*, *L*, *G*, *C*, and λ at 100MHz.	10	1	Applying
		UNIT-II			
3.	a	Define reflection coefficient? Derive an expression for input impedance.	5	2	Understanding
	b	Derive the relation between standing wave ratio and reflection coefficient.	5	2	Analyzing
		(OR)			
4.		Write the procedure of determining input impedance and load impedance of a transmission line using Smith Chart.	10	2	Understanding
		UNIT-III			
5.	a	Derive Poisson's and Laplace's equations.	5	3	Analyzing
	b	A point charge, Q = 10nC is at the origin in free space. Find the electric field at P (1, 0, 1). Also find the electric flux density at P.	5	3	Applying
		(OR)			
6.	a	Define Electric Potential and obtain the expression for it.	5	3	Understanding
	b	Derive the electric field intensity due to infinite line charge.	5	3	Analyzing
		UNIT-IV			
7.		State and prove the Maxwell 's Two Equations for Magneto static Fields.	10	4	Understanding
		(OR)			
8.	a	What is the magnetic field, **H** in Cartesian coordinates due to *z*-directed current element? if I = 2A.	5	4	Applying
	b	Define Magnetic Flux Density and obtain the expression for it.	5	4	Understanding
		UNIT-V			
9.	a	What is the inconsistency of Ampere's Law? Explain	5	5	Understanding
	b	Discuss the boundary conditions for conductor-dielectric boundary in electrostatics.	5	5	Understanding
		(OR)			
10.		State and explain with word statements Maxwell's equations in differential and integral forms.	10	5	Analyzing
		UNIT-VI			
11.	a	Derive the relation between E and H in a uniform plane wave.	5	6	Analyzing
	b	Using Maxwell's equations, obtain wave equations for a perfect dielectric media.	5	6	Analyzing
		(OR)			
12.	a	Explain the concept of polarization in Dielectrics.	5	6	Understanding
	b	Explain the propagation of wave in good conductors.	5	6	Understanding

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CODE: 20CST207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Regular Examinations, July, 2022

OPERATING SYSTEMS

(Common to CSE & IT)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.	a	Define an operating system. State and explain the basic functions or services of an operating system.	5	CO1	K1
	b	Define process and explain different state of the process.	5	CO1	K2
		(OR)			
2.	a	A scheduling mechanism should consider various scheduling criteria to realize the scheduling objectives. List out all the criteria.	5	CO1	K1
	b	Explain why must the operating system be more careful when accessing input to a system call (or producing the result) when the data is in memory instead of registers?	5	CO1	K2
		UNIT-II	Marks	CO	Blooms Level
3.	a	State the requirements that a solution to the critical section problem must satisfy.	5	CO2	K2
	b	Explain the Readers and Writers problem and its solution using the concept of semaphores.	5	CO2	K2
		(OR)			
4.	a	State the assumption behind the bounded buffer producer consumer problem and explain it.	5	CO2	K2
	b	Describe dining-philosophers problem. Device an algorithm to solve the problem using semaphores.	5	CO2	K2
		UNIT-III	Marks	CO	Blooms Level
5.	a	Define deadlock. What are the four conditions necessary for a deadlock situation to arise? How it can be prevented?	5	CO3	K1
	b	State and explain the methods involved in recovery from deadlocks.	5	CO3	K2
		(OR)			
6.	a	Describe resource-allocation graph. Explain how resource graph can be used for detecting deadlocks?	5	CO3	K2
	b	A system contains three programs and each requires three tape units for its operation. Find the minimum number of tape units which the system must have such that deadlocks never arise.	5	CO3	K3

			Marks	CO	Blooms Level
		UNIT-IV			
7.	a	Distinguish between logical address and physical address with a neat diagram.	5	CO4	K2
	b	Differentiate among the main memory organization schemes of contiguous- memory allocation, segmentation, and paging.	5	CO4	K2
		(OR)			
8.	a	List dynamic storage allocation strategies in contiguous memory allocation scheme.	5	CO4	K1
	b	Explain the basic Scheme of page replacement and about the various page replacement strategies with examples.	5	CO4	K2

			Marks	CO	Blooms Level
		UNIT-V			
9.	a	Explain low-level formatting or physical formatting with an example.	5	CO5	K1
	b	Explain any two file access method.	5	CO5	K3
		(OR)			
10.	a	Discuss File system mounting and Thrashing with neat diagram.	5	CO5	K1
	b	Find the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? The block size is 512 bytes. Disk block numbers can be stored in 4 bytes.	5	CO5	K3

			Marks	CO	Blooms Level
		UNIT-VI			
11.	a	Discuss about Disk space management and Swap - space management.	5	CO6	K1
	b	Explain with example FCFS disk scheduling.	5	CO6	K3
		(OR)			
12.	a	Discuss the reasons why the operating system might require accurate information on how blocks are stored on disk. How could operating system improves file system performance with this knowledge.	5	CO6	K3
	b	Explain different free disk-space management techniques with an illustration.	5	CO6	K2

AR18

CODE: 18CET207 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B. Tech II Semester Supplementary Examinations, July,2022
FLUID MECHANICS-II
(Civil Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	With a neat sketch explain the characteristics of water surface profile in critical sloped channels.	[5M]
	b)	A rectangular channel 3.5m wide is laid on a slope of 0.0005. Calculate the normal depth of flow for a discharge of 5m3 /s in this channel. The Manning's coefficient can be taken as 0.02.	[7M]
		(OR)	
2.	a)	What are the assumptions made for deriving dynamic equation for gradually varied flow?	[4M]
	b)	Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $\Delta E=(v_1-v_2)^3/2g\ (v_1+v_2)$	[8M]

UNIT-II

3.	a)	How to find the work done and efficiency when flow is over radial vanes?	[5M]
	b)	A jet of water 6 cm in diameter moving with a velocity of 30 m/s strikes a fixed flat plate in such a way that the angle between the Jet axis and plate is 60^o. Find the force exerted on plate (i) in the direction normal to plate (ii) in the direction of the Jet.	[7M]
		(OR)	
4.		A 3 cm diameter of Jet strikes without shock on a series of vanes. The Jet velocity is 50 m/sec and vane moves in the same direction as that of the Jet and deflects through an angle of 170^o the vanes move in the same direction as that of Jet with a velocity of 30 m/sec. If the water flow ratio is 180 liters/sec, determine the component of forces on the vane. Find the power developed and vane efficiency.	[12M]

UNIT-III

5.	a)	Differentiate between Francis turbine and Kaplan turbine mentioning the principle of working advantages and applications.	[5M]
	b)	A Kaplan turbine is designed to develop 20 MW under a head of 25 m and a speed of 150rpm. The hydraulic efficiency is 95 %. Overall efficiency is 85 % and outer diameter is 5 m. and diameter of hub is 2 m. Determine runner vane angles at the hub and at the outer periphery. Assume that the turbine discharges without whirl at exit.	[7M]
		(OR)	
6.	a)	Discuss the characteristic curves of Hydraulic turbines.	[6M]
	b)	Discuss the significance of unit quantities and specific quantities	[6M]

UNIT-IV

7.	a)	Discuss the phenomenon behind pouring of water in centrifugal pump.	[5M]
	b)	A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outlet diameter of the impeller is 500 mm and width at outlet is 50 mm, determine: i) vane angle at inlet, ii) work done by impeller on water per second, and iii) Manometric efficiency.	[7M]
		(OR)	
8.		What is the need for multi staging of Centrifugal pumps? Describe the working of multi stage pump with a) impellers in parallel b) impellers in series	[12M]

UNIT-V

9.	a)	Obtain a relationship for the torque τ to rotate a disk of diameter D in a fluid of viscosity μ at an angular speed ω over a plate, with clearance h.	[8M]
	b)	Distinguish between Reynolds number and Froude number.	[4M]
		(OR)	
10.	a)	A water tunnel operates with a velocity of 3m/s at the test section and power required was 3.75 kW. If the tunnel is to operate with air, determine for similitude the flow velocity and the power required. Take $\rho a = 1.25$ kg/m3, $\gamma a = 14.8 \times 10–6$ m2/s, $\gamma w = 1.14 \times 10–6$ m2/s.	[6M]
	b)	The frictional torque T of a disc of diameter D rotating at a speed of N in a fluid of viscosity μ and density ρ in a turbulent flow is given by $T=D^5N^2\ \rho\phi(\mu/D^2N\rho)$.	[6M]

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AR18

CODE: 18EET209 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, July,2022

CONTROL SYSTEMS

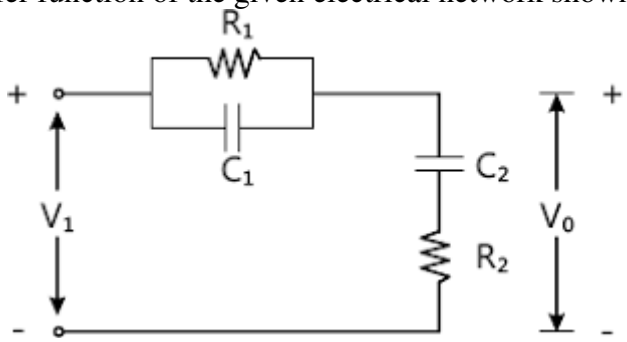
(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

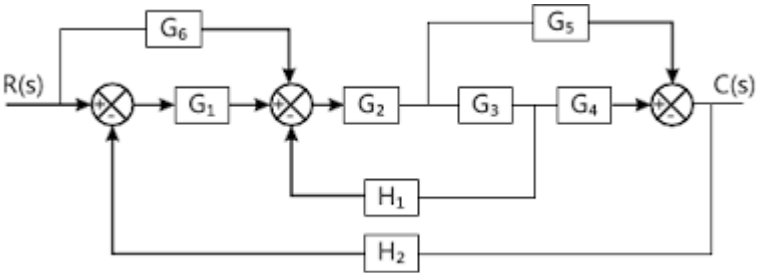
UNIT-I

1. a) Differentiate between open loop and closed loop control systems 4M
   b) Derive the Transfer function of the given electrical network shown in figure below. 8M



(OR)

2. Derive the Transfer function of the Block Diagram using Block Diagram Reduction Technique. 12M



UNIT-II

3. a) Explain the operation of synchro as error detector. 6M
   b) The open loop transfer function of a feedback control system is given by 6M
   $G(s)H(s) = \frac{400}{s^2(s+4)(s+12)}$. Determine the static error coefficients. Also determine the steady state error for the input $r(t) = 2t^2 + 5t + 10$.

(OR)

4. a) The open loop transfer function of a unity feedback control system is given by $\frac{9}{s(s+3)}$. Find natural frequency of response , damping ratio, damped frequency and time constant. 6M

b) Derive the expression for transient response of second order system when excited by step input. 6M

UNIT-III

5. a) Examine the stability by Routh's criterion for the given characteristic equation 6M

$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 15 = 0$

b) Explain in detail about Routh Hurwitz criteria for stability. 6M

(OR)

6. a) Explain the step by step procedure for construction of root locus for open loop transfer function of control system. 8M

b) Write a short note on 4M

i. Break even point ii. Break away point

iii. Angle of arrival iv. Angle of Departure.

UNIT-IV

7. Sketch the Bode plot of given open loop transfer function $G(s) = \frac{100}{S(s+5)(s+10)}$. 12M

Determine the phase margin and gain margin from the plot.

(OR)

8. a) Sketch the polar plot for the open loop system given as $G(S) = \frac{S+4}{(S+1)(S-1)}$ 8M

b) Explain in detail about the significance of Nyquist plot? 4M

UNIT-V

9. a) Classify the types of compensators and briefly explain about it. 6M

b) What is lead compensator? Obtain the transfer function of lead compensator. Sketch the pole –zero plot. 6M

(OR)

10. a) List the properties of state transition matrix 4M

b) 8M

Consider an autonomous system characterised by state equation $\dot{X} = AX$

Where $A = \begin{bmatrix} -3 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix}$

Determine the State Transition Matrix.

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AR18

CODE: 18MET205 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, July,2022

IC ENGINES

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	Give a brief note on comparison between SI and CI engines.	6M
	b)	Explain the following parts of IC engine with appropriate sketches: (a) Cylinder (b) Piston Rings (c) Crank case (d) Crank shaft.	6M
		(OR)	
2.	a)	What is valve timing diagram? Explain valve timing diagram of a four stroke otto cycle engine.	6M
	b)	Briefly explain with PV diagram the working of a two stroke cycle engine?	6M

UNIT-II

3.		Briefly explain the combustion phenomenon in SI engine with the help of Pθ diagram?	12M
		(OR)	
4.	a)	Explain the difference between pre-ignition and auto-ignition? How pre-ignition can be detected?	6M
	b)	Define performance number? Explain the main factors that influence the flame speed.	6M

UNIT-III

5.	a)	Explain the following performance parameters: (a) Indicated power (b) Mean effective pressure (c) Specific output (d) Volumetric efficiency.	6M
	b)	With a neat sketch explain the working of Wankel engine?	6M
		(OR)	
6.	a)	What is a dual-fuel engine? Where are they used? State their advantages?	6M
	b)	Explain Homogeneous Charge Compression Ignition (HCCI) with advantages and disadvantages?	6M

UNIT-IV

7.	a)	What are the effects of the following factors on the exhaust emission? (a) Air-fuel ratio ; (b) Surface volume ratio; (c) Engine speed	6M
	b)	Explain briefly the factors which effect the formation of NO_x and SO_x?	6M
		(OR)	
8.	a)	What are alternate fuels? Explain their need in terms of emissions?	6M
	b)	Give a brief note on EURO and BHARAT emission norms.	6M

UNIT-V

9.	a)	Explain the differences between rotary and reciprocating air compressor	6M
	b)	With a neat sketch explain the working of reciprocating air compressor.	6M
		(OR)	
10.		Explain the following (i) roots blower (ii) vane sealed compressor (iii) axial flow compressors	12M

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AR18

CODE: 18ECT209 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, July, 2022

DIGITAL ELECTRONICS

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Solve for X. 6M
   i) $(1256)_8 = (X)_2$ ii) $(19.125)_{10} = (X)_8$ iii) $(10011.11)_2 = (X)_{16}$
   b) List and explain different error detecting codes with examples. 6M

(OR)

2. a) Explain the procedure involved in subtraction of binary numbers using 1's and 2's complements with an example. 6M
   b) Explain alphanumeric and self- complement codes with examples. 6M

UNIT-II

3. a) Obtain the minimal expression for f = Σ m (1, 2, 3, 6, 7, 8) using and verify the result with K-map. 6M
   b) Express the following functions in sum of minterms and product of maxterms form. 6M
   i. (A,B,C,D)=AB+BC+AD ii. F(x,y,z)=(xy+z)(xz+y)

(OR)

4. a) Implement all logic gates using NOR gates only. 6M
   b) Find the complement of the following Boolean expressions. 6M
   i) $x\bar{y} + \bar{x}y$ ii) $(A\bar{B} + C)\overline{D} + E$

UNIT-III

5. a) Design full adder using logic gates and truth table 6M
   b) Design a half subtractor. 6M

(OR)

6. a) Explain the operation of an excess-3 adder. 6M
   b) Design a 4-bit binary parallel subtractor. 6M

UNIT-IV

7. a) Implement the logic function F (A,B,C) = Σ m(1,2,4,7) using 4x1 multiplexer. 6M
   b) Design a 2-bit magnitude comparator using logic gates. 6M

(OR)

8. Draw and explain the operation of LED 7 segment display with suitable truth tables. 12M

UNIT-V

9. a) Explain the operation of RS flipflop. 6M
   b) Convert RS flip flop into JK flip flop. 6M

(OR)

10. a) Design a mod-6 asynchronous counter using T flip flops. 6M
    b) Draw and explain a 4-bit twisted ring counter. 6M

AR18

CODE: 18CST206 SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B. Tech II Semester Supplementary Examinations, July,2022

OPERATING SYSTEMS

(Common to CSE & IT)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) List and explain about the services provided by operating systems. 5M
   b) Assume the following workload in a system. All jobs are arrived in the following order given 7M

Process	Arrival Time	Burst Time
P1	2	1
P2	1	5
P3	4	1
P4	0	6
P5	2	3

Draw a Gantt chart illustrating SJF with Pre emption and also Calculate the Avg. Waiting Time and Turnaround Time.

(OR)

2. a) Explain in detail about Real Time Operating systems and its applications. 6M
   b) With a neat diagram, explain the process states. 6M

UNIT-II

3. a) What is the important feature of critical section? State and explain the producer and consumer problem. 6M
   b) Explain the techniques used to prevent the deadlock. 6M

(OR)

4. a) Explain about Dinning Philosophers Problem using Semaphore. 6M
   b) Explain the banker's algorithm for deadlock avoidance with illustration. 6M

UNIT-III

5. a) What is the cause of thrashing? How the system does detect thrashing? How to eliminate this problem. 6M
   b) Consider the following page reference string : 1,2,4,7,3,5,6,3,1,4,2,3,6,5,2 How many page faults would occur for the LRU page replacement algorithm. Assuming four frames and all frames are initially empty. 6M

(OR)

6. a) What is virtual memory? Discuss the benefits of virtual memory techniques. 6M
   b) What are the disadvantages of single contiguous memory allocation? Explain. 6M

UNIT-IV

7. a) What is a file? Explain about Direct access and Indexed access files. 6M
   b) Explain about single-level, two-level and Tree –Structured directories. 6M

(OR)

8. a) What are the objectives of file management system? Explain file system architecture. 6M
   b) Explain any 2 file allocation methods with neat sketch. 6M

UNIT-V

. a) Distinguish between Host attached storage and Network attached storage with a neat diagram. 6M
   b) Consider the disk queue with following request for I/O blocks on cylinders 98,123,37,122, 14,124,65,67 (Assume disk head is at 53). Draw SSTF scheduling. 6M

(OR)

10. a) Explain in detail about the disk structure. 6M
    b) Write short notes on (i) FCFS and (ii) SCAN disk scheduling schemes. 6M

AR16

CODE: 16CE2009 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, July, 2022
STRENGTH OF MATERIALS-II
(Civil Engineering)

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

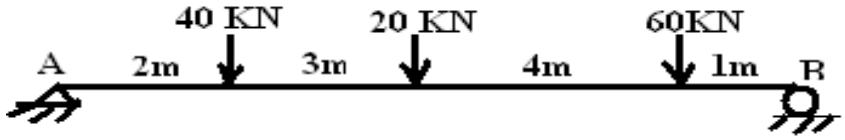
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. A cantilever beam of length 6m carries a uniformly distributed load of intensity 10kN/m over its entire length. Find the slope and deflection at the free end. Take E = 200 X 10^6 kN/m^2 and Moment of inertia (I)=30 X 10^{-5} m^4. 14M

(OR)

2. A simply supported beam of span 10m is loaded as shown in figure. 14M



Determine the magnitude of maximum deflection. Given E=200kN/mm^2 and I= 695.054x10^6 mm^4.

UNIT-II

3. a) The principal stresses at a point in a piece of steel are 90 MPa tensile and 60 MPa compressive. Find the intensity and direction of the stress across a plane the normal of which is inclined at 30^0 to the axis of the 90 MPa principal stress, the plane being also perpendicular to the plane of zero stress. 7M

   b) A steel bar is 10 m long and 100 mm x 25 mm in section. It is subjected to an axial pull of 250 kN. Determine the intensities of normal and tangential stresses on a plane section inclined at 60^0 to the longitudinal axis. 7M

(OR)

4. a) Derive an expression for a body subjected to direct stress in one plane. 7M

   b) At a point within a body subjected to two mutually perpendicular directions the stresses are 120N/mm^2 tensile and 80N/mm^2 compressive. Determine the normal, shear and resultant stresses on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress. 7M

UNIT-III

5. A shell 3.25m long, 1m in diameter is subjected to an internal pressure of 1N/mm^2. If thickness of the shell is 10mm, find the circumferential and longitudinal stresses. And also find the maximum shear stress and the changes in the dimensions of the shell. Take E = 2×10^5 N/mm^2 and poison's ratio=0.3. 14M

(OR)

6. A cylinder air receiver for a compressor is 3m in internal diameter and made of plates 10mm thick. If the hoop stress is not to exceed 70 N/mm^2 and the axial stress is not to exceed 50 N/mm^2, find the maximum safe air pressure. 14M

UNIT-IV

7. A tube 80 mm inside and 120 mm outside diameter is to be reinforced by shrinking on a second tube of 160 mm outside diameter. The compound tube is to withstand an internal pressure of 35 MPa and the shrinkage allowance is to be such that the final maximum stress in each tube is to be the same. Calculate this stress. What is the initial difference of diameters before shrinking on (E = 200 GPa). 14M

(OR)

8. Determine the maximum and minimum hoop stress across the section of a pipe 400 mm internal diameter and 100 mm thick when the pipe contains a fluid at a pressure of 8 N/mm^2. 14M

UNIT-V

9. List the assumptions made in Euler's theory of buckling? Derive an expression for the Euler's buckling load for a column fixed at both ends? 14M

(OR)

10. A solid round bar 3 m and 50 mm diameter is used as a strut. Determine the crippling load for the below cases. Take E = $2X10^5$ N/mm^2. 14M
    1. When both ends hinged
    2. One end is fixed and other end free
    3. One end is fixed and other end hinged

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AR16

CODE: 16EE2013 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, July, 2022

CONTROL SYSTEMS

(Electrical & Electronics Engineering)

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

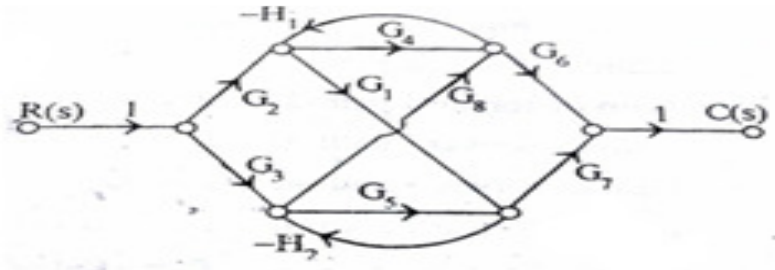
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Write differences between open loop and closed loop systems. 7M
   b) Explain effect of feedback characteristics 7M

(OR)

2. Determine the closed loop transfer function for the given signal flow graph. 14M



UNIT-II

3. Derive an expression for the transfer function of an DC armature controlled Servo motor. 14M

(OR)

4. a) Define the following terms related to time domain specifications of a standard second order control system: 7M
      i) Delay time ii) Rise time iii) Peak time
   b) Derive expressions for the steady state errors of type – 0, type – 1 and type – 2 systems excited by a unit ramp input. 7M

UNIT-III

5. For a unity feedback system having forward path t.f $G(s)=\frac{K(s+4)}{s(s+1)(s+2)}$, determine the (i) range of values of K, (ii) value of *K* that makes the system to oscillate, and (iii) frequency of sustained oscillations. 14M

(OR)

6. Sketch the root locus for the system having the open loop transfer function $G(s)H(s)=\frac{K}{s(s+1)(s+3)}$ 14M

UNIT-IV

7. a) Consider the open loop transfer function of a closed loop control system G(s)=(1000(S+1))/((S+2) (S+3)) and find the stability of the system by using Bode Plot. 10M

   b) Define the following 4M
   (i) Gain Margin (ii) Phase crossover frequency

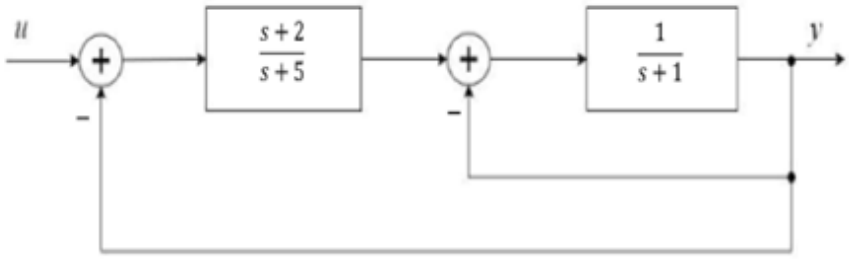
(OR)

8. Consider the open loop transfer function of a closed loop control system G(s)=1/(S(S+2) (S+3)) and find the stability of the system by using Nyquist plot 14M

UNIT-V

9. a) What is lead compensator? Derive the transfer function of lead compensator 7M

   b) Obtain state space model for the given blck diagram representation of control system. 7M



(OR)

10. The state equations of the LTIV system are given by 14M

$$\dot{X}=\begin{bmatrix}-1 & -1\\ 1 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}1\\ 0\end{bmatrix}U(t) \;\&\; Y=[0\ \ 1]\begin{bmatrix}X_1\\ X_2\end{bmatrix}$$

i) Determine the STM

ii) Find the transfer function

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AR16

CODE: 16ME2011 **SET 1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, July,2022

MACHINE DRAWING
(Mechanical Engineering)

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

Note: Answer any two questions from section-A
Section - B is compulsory **(2x15=30Marks)**

Section- A

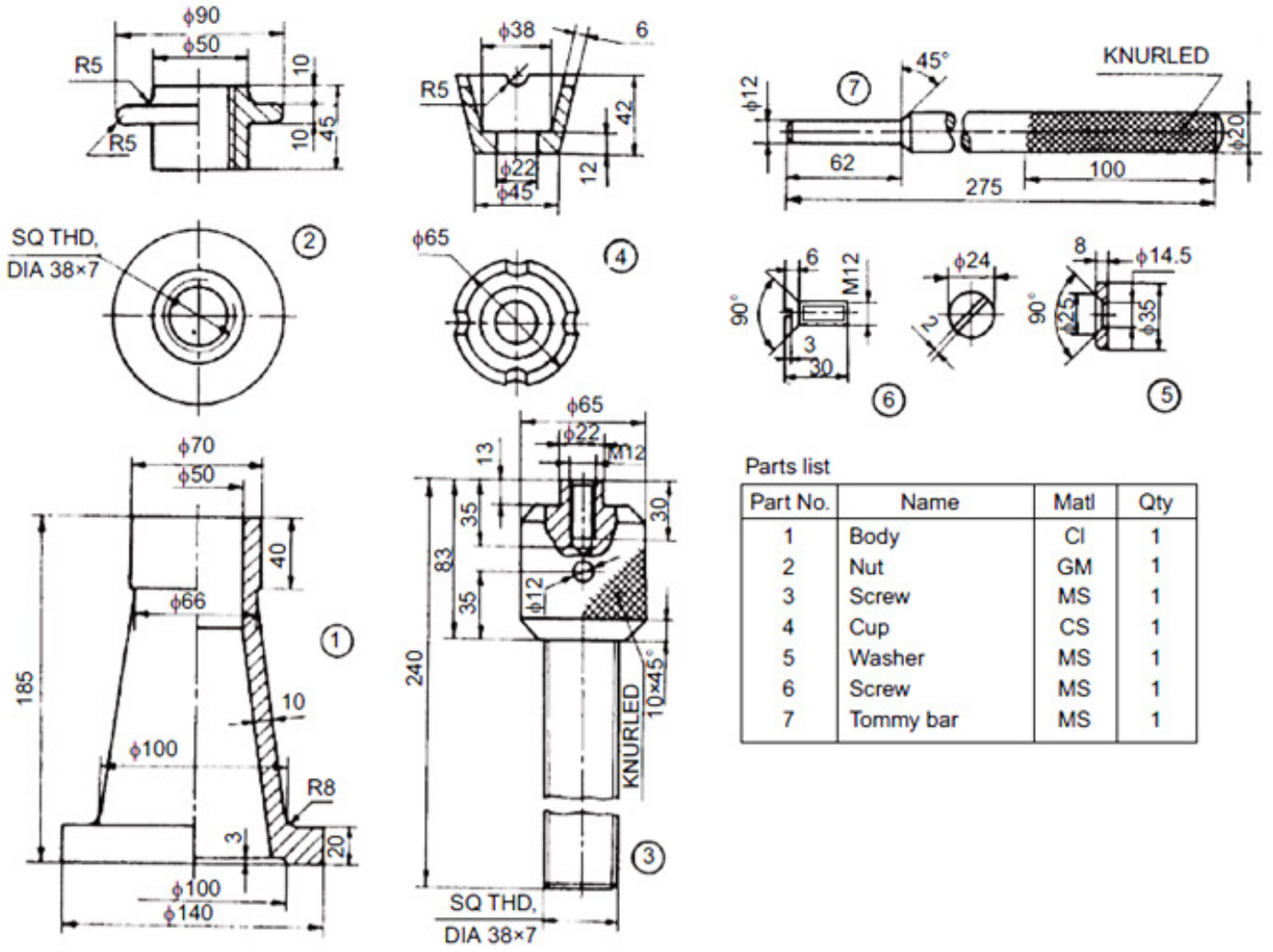
1. Draw the sectional front view and top view of a Double riveted, double strap zig-zag butt joint. 15

2. Draw half sectional front view and top view of a foot step bearing for 40 mm diameter 15

3. Draw the sectional front view and top view of a Cotter joint with Gib 15

Section- B

4. Assemble all parts of the screw jack, shown in Figure and draw the following views: **(40Marks)**
   (i) Half sectional front view, and
   (ii) Top view.



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

Screw jack

AR16

CODE: 16EC2010 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, July, 2022

DIGITAL ELECTRONICS

(Electronics and Communication Engineering)

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

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	Convert the Octal number 623 to decimal, binary, and hexadecimal.	6M
	b)	Encode each of the decimal digits 0, 1, …, 9 by means of the following weighted binary codes: i) 6 3 1 –1 ii)7 3 2 –1 iii) 5 4 –2 –1 iv) 8 7 – 4 –2	8M

(OR)

2.	a)	The binary numbers listed have a sign bit in the left most position, and, if negative, numbers are in 2's complement form. Perform the arithmetic operations indicated and verify the answers. i) 101011 + 111000 ii) 111001 – 001010	8M
	b)	Perform the following addition using BCD code. i) 386+756 ii) 1010+444	6M

UNIT-II

3.	a)	Reduce the following Boolean expressions to the indicated number of literals: i) $A'C' + ABC + AC'$ to three literals ii) $(A' + C)(A' + C')(A + B + C'D)$ to four literals	6M
	b)	Minimize the following function using K-map and realize using NAND gates: F (w, x, y, z) = Σ m (0, 2, 3, 4, 6, 7, 8, 10, 13) + d (5, 14)	8M

(OR)

4.	a)	Convert the following expressions into product of sums form: i) $(AB + C)(B + C'D)$ ii) $x' + x(x + y')(y + z')$	6M
	b)	Find the complement of $F = x + yz$; then show that $F \cdot \bar{F} = 0$ and $F + \bar{F} = 1$.	8M

UNIT-III

5.	a)	Draw and explain a 4-bit adder-subtractor circuit.	6M
	b)	Design a combinational circuit that produces a Excess-3 addition and explain it.	8M

(OR)

6.	a)	Draw and explain the Truth table and Logic diagram of a Full subtractor.	8M
	b)	Design a half subtractor circuit Explain it.	6M

UNIT-IV

7.	a)	Design and implement 2-bit comparator using logic gates.	8M
	b)	Implement a full-adder circuit with two 4×1 Multiplexers.	6M

(OR)

8.	a)	Implement a full-adder circuit with a 3×8 decoder and two OR gates.	6M
	b)	Design a combinational circuit that converts a BCD code into 8 4 – 2 – 1 code.	8M

UNIT-V

9.	a)	Draw the logic diagram of positive edge-triggered D-flipflop using NAND gates and explain.	7M
	b)	With the help of neat diagram, explain the operation of BCD ripple counter.	7M

(OR)

10.	a)	Convert a RS flip-flop into a JK Flip-flop.	6M
	b)	Explain the working of 4-bit universal shift register with the help of diagram.	8M

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AR16

CODE: 16CS2009 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, July, 2022

OPERATING SYSTEMS

(Common to CSE & IT)

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

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	What are the advantages and disadvantages of using the same system call interface for manipulating both files and devices.	7M
	b)	Write and explain various scheduling criteria's with respect CPU scheduling. And show the calculations for at least 5 processes arriving at consecutive intervals.	7M

(OR)

2.	a)	Explain in detail, the sequence of actions taken by the operating system to context switch between processes.	7M
	b)	Consider the following 4 processes represented as (Process, Arrival Time, Burst Time) with the length of CPU burst in milliseconds. { (P1, 0, 10), (P2, 1, 7), (P3, 2, 13), (P4, 3, 11) }. Using preemptive SJF scheduling: i) Draw Gantt chart. ii) Calculate average waiting time.	7M

UNIT-II

3.	a)	Write about Characterization of deadlock by resource allocation graph.	7M
	b)	Explain about software-based Peterson's solution to the critical-section problem.	7M

(OR)

4.	a)	What are the necessary conditions for a Deadlock? Discuss.	7M
	b)	What happens if the wait() and signal() semaphore operations are not executed atomically? Give explanation.	7M

UNIT-III

5.	a)	What is a page fault? Explain the steps involved in handling a page fault with a neat sketch.	7M
	b)	Explain the process of converting virtual addresses to physical addresses with a neat diagram..	7M

(OR)

6.	a)	How demand paging affects the performance of a computer system? Give explanation..	7M
	b)	How does the system detect Thrashing? What can the system do to eliminate this problem? Explain.	7M

UNIT-IV

7.	a)	Discuss various file access methods in detail.	7M
	b)	Explain about file system implementation.	7M

(OR)

8.	a)	Briefly explain about single-level, two-level and Tree-Structured directories.	7M
	b)	Explain about various file allocation methods.	7M

UNIT-V

9.	a)	Write overview of mass storage structure in detail.	7M
	b)	Explain about various issues involved in selecting appropriate disk scheduling algorithm.	7M

(OR)

10.	a)	Discuss in detail about file directory structure.	7M
	b)	Explain and compare the FCFS and SSTF disk scheduling algorithms.	7M

AR13

CODE: 13CE2006 SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.TECH II SEM SUPPLEMENTARY EXAMINATIONS, JULY,2022

STRENGTH OF MATERIALS-II
(Civil Engineering)

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

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Write down the expression for major principal stress, minor principal stress and maximum shear stress when a thin cylindrical shell is subjected to internal fluid pressure and torque.
   b) Write an expression for the change in volume of a thin cylindrical shell subjected to internal fluid pressure.
   c) What do you mean by Lame's equations ?
   d) Define the term 'obliquity' and write how it is determined.
   e) Write an expression for the stresses on an oblique plane of rectangular body, when the body is subjected to a simple shear stress.
   f) Write an expression for the torque transmitted by a hollow circular shaft of external diameter = D_0 and internal diameter = D_i.
   g) Define the term 'Polar modulus'.
   h) Define torsional rigidity of a shaft.
   i) Explain the assumptions made in Euler's column theory.
   j) Write an expression for crippling load for a long column when one end of the column is fixed and other end is hinged.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Find the expression for circumferential stress and longitudinal stress for a longitudinal joint and circumferential joint. 6M
   b) A cylinder of internal diameter 0.50m contains air at a pressure of 7N/mm^2 (gauge). If the maximum permissible stress induced in the material is 80 N/mm^2, find the thickness of the cylinder. 6M

(OR)

3. A cast iron pipe of 200mm internal diameter and 12mm thick is wound closely with a single layer of circular steel wire of 5mm diameter, under a tension of 60 N/mm^2. Find the internal compressive stress in the pipe section. Also find the stresses set up in the pipe and steel wire, when water under a pressure of 3.5N/mm^2 is admitted into the pipe. Take E for cast iron as 1×10^5 N/mm^2 and for steel as 2×10^5 N/mm^2. Poisson's ratio is given as 0.3. 12M

UNIT-II

4. a) Derive an expression for the radial pressure and hoop stress for a thick spherical shell. 6M
   b) Determine the maximum and minimum hoop stress across the section of a pipe of 400mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section. 6M

(OR)

5. A steel tube of 200 mm external diameter is to be shrunk into another steel tube of 60 mm internal diameter. The diameter at the junction after shrinking is 120mm. Before shrinking on, The difference of diameters at the junction is 0.08 mm. Calculate the radial pressure at the junction and the hoop stresses developed in the two tubes after shrinking on. Take E as 2×10^5 N/mm^2. 12M

UNIT-III

6. a) Derive an expression for the major and minor principal stresses on an oblique plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress. 6M

   b) At a point within a body subjected to two mutually perpendicular directions, the stresses are 80N/mm^2 tensile and 40N/mm^2 tensile. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2. Determine the normal stress, shear stress and resultant stress on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress. 6M

(OR)

7. An elemental cube is subjected to tensile stresses of 30 N/mm^2 and 10 N/mm^2 acting on two mutually perpendicular planes and a shear stress of 10 N/mm^2 on these planes. Draw the Mohr's circle of stresses and hence or otherwise determine the magnitudes and directions of principals stresses and also the greatest shear stress. 12M

UNIT-IV

8. a) When a circular shaft is subjected to torsion show that the shear stress varies linearly from the axis to the surface. 6M

   b) A solid circular shaft and a hollow circular shaft whose inside diameter is (3/4) of the outside diameter, are of the same material, of equal lengths and are required to transmit a given torque. Compare the weights of these two shafts if the maximum shear stress developed in the two shafts are equal. 6M

(OR)

9. A composite shaft consists of copper rod of 30 mm diameter enclosed in a steel tube of external diameter 50 mm and 10 mm thick. The shaft is required to transmit a torque of 1000 N-m. Determine the shear stresses developed in copper and steel, if both the shafts have equal lengths and welded to a plate at each end, so that their twists are equal. Take modulus of rigidity for steel as twice that of copper. 12M

UNIT-V

10. a) Derive the equation for the Euler's crippling load for a column with one end fixed and the other is free. 6M

    b) A simply supported beam of length 4 meter is subjected to a uniformly distributed load of 30 kN/m over the whole span and deflects 15mm at the centre. Determine the crippling loads when this beam is used as a column with the following conditions: 6M
    i) one end fixed and other end hinged ii) both the ends pin jointed.

(OR)

11. A hollow cylindrical cast iron column is 4 m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250kN with a factor of safety of 5. Take the internal diameter as 0.8 times the external diameter. Take σ_c = 550 N/mm^2 and α = 1/1600 in Rankine's formula. 12M

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AR13

CODE:13EE2009 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, July, 2022

CONTROL SYSTEMS
(Electrical and Electronics Engineering)

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

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

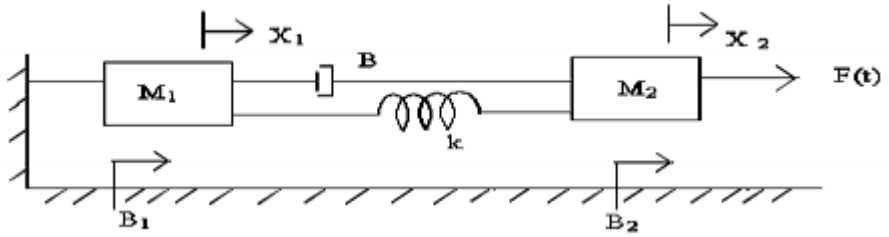
1. a) What is meant by a closed loop control system? Give example.
   b) What are the advantages and disadvantages of open loop control system
   c) What is the difference between AC servo motor and DC servo motor?
   d) What is a synchro?
   e) What is meant by steady state response?
   f) What happens when a system is not stable?
   g) Define phase margin and gain margin?
   h) State the Nyquist stability theorem
   i) What is the need of lag-lead compensator?
   j) What is controllability?

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

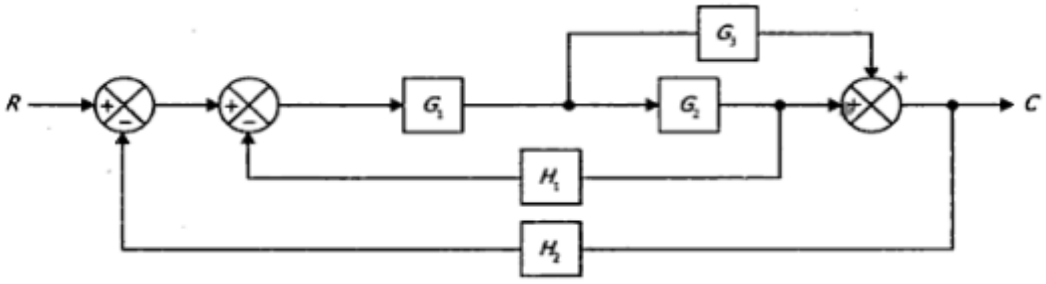
2. a) Write the differential equations governing the Mechanical system shown in fig. and determine the transfer function 8M



   b) State and explain the Mason's gain formula 4M

(OR)

3. a) Obtain the transfer function C/R for the block diagram shown in the fig 8M



   b) What is control system? Explain about Open Loop and Closed Loop Systems 4M

UNIT-II

4. Draw the response of second order system for under damped case and when input is unit step. 12M

(OR)

5. a) Define the steady state error and error constants of different types of inputs 4M

   b) Damping factor and natural frequency of the system are 0.12 and 84.2 rad/sec respectively. Determine the rise time, peak time, maximum peak overshoot and settling time. 8M

UNIT-III

6. Explain the step by step procedure to draw root locus of a given transfer function. 12M

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(OR)

7. Sketch the root locus for the open loop transfer function of unity feedback control system given below: G(S) H(S) =K/S(S+1) (S+2).Also find K of breakaway point 12M

UNIT-IV

8. Sketch the Bode plot of given open loop transfer function 12M

$$G(s) = \frac{100}{S(s+5)(s+10)}$$

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Determine the phase margin and gain margin from the plot.

(OR)

9. Construct the polar plot for the function GH(S) =2(S+1)/ S2. Find Gain cross over frequency, Phase cross over frequency, Gain margin and Phase margin. 12M

UNIT-V

10. What is compensation? Why it is needed for control system? Explain the types of compensation 12M

(OR)

11. Consider an autonomous system characterised by state equation $\dot{X} = AX$, Where 12M

$$A = \begin{bmatrix} -3 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix}$$

Determine the State Transition Matrix.

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