

**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

<u><b>UNIT-I</b></u>		Marks	CO	Blooms Level
1.	a) Explain different road development plans in India.	6 M	CO1	Understand
	b) Explain the role of Indian Roads Congress and Central Road Research Institute in road development.	4 M	CO1	Create
<b>(OR)</b>				
2.	a) Discuss various factors controlling Highway Alignment.	5 M	CO1	Analyse
	b) What is the need to conduct planning surveys for highway projects explain briefly?	5 M	CO1	Analyse
<u><b>UNIT-II</b></u>				
3.	a) Define the camber and explain the factors affecting camber along with IRC specified values.	4 M	CO2	Understand & Analyse
	b) Design the super-elevation for highways with design speed of 90 Km/h. Radius of horizontal curve is 190 m and maximum allowable super elevation is 7%. Safe limit of transverse coefficient of friction is 0.15.	6 M	CO2	Evaluate
<b>(OR)</b>				
4.	a) Calculate the stopping sight distance for single lane two ways for a design speed of 90 km/h. Take the total reaction time 2.5 seconds and the coefficient of friction = 0.35.	4 M	CO2	Evaluate
	b) Derive an expression for overtaking sight distance.	6 M	CO2	Create & Evaluate
<u><b>UNIT-III</b></u>				
5.	a) Write the objectives and requirement of Bituminous mix design.	5 M	CO3	Understand & Analyse
	b) Explain aggregate impact value (AIV) test procedure for knowing aggregate hardness.	5 M	CO3	Evaluate

**(OR)**

- |    |    |  |     |     |                      |
|----|----|--|-----|-----|----------------------|
| 6. | a) | Explain the desirable properties of bitumin.   | 5 M | CO3 | Understand & Analyse |
|    | b) | Explain CBR and the test procedure for laboratory and field tests. How the results of the test obtained and interpreted? | 5 M | CO3 | Analyse & Evaluate   |

#### UNIT-IV

- |    |    |   |     |     |            |
|----|----|---|-----|-----|------------|
| 7. | a) | Distinguish between Flexible and Rigid Pavements        | 5 M | CO4 | Analyse    |
|    | b) | Explain the procedure for construction of earthen road. | 5 M | CO4 | Understand |

(OR)

- |    |    |  |     |     |            |
|----|----|--|-----|-----|------------|
| 8. | a) | Briefly discuss the importance of highway maintenance    | 5 M | CO4 | Analyse    |
|    | b) | Compare the construction procedures of WBM and WMM roads | 5 M | CO4 | Understand |

#### UNIT-V

- |    |    |   |     |     |         |
|----|----|---|-----|-----|---------|
| 9. | a) | Briefly explain various tests to be conducted for a origin and destination (O-D) surveys. | 5 M | CO5 | Analyse |
|    | b) | briefly explains about vehicle & driver characteristics.                                  | 5 M | CO5 | Analyse |

(OR)

- |     |    |  |     |     |                  |
|-----|----|--|-----|-----|------------------|
| 10. | a) | Explain the relation between speed, flow & density with neat sketch. | 6 M | CO5 | Create & Analyse |
|     | b) | Explain spot speed, running speed, space mean speed, time mean speed | 4 M | CO5 | Analyse          |

#### UNIT-VI

- |     |    |   |     |     |                      |
|-----|----|---|-----|-----|----------------------|
| 11. | a) | Define the Level of service (LOS) with neat sketch and explain factors effecting LOS. | 5 M | CO6 | Understand & Analyse |
|     | b) | Discuss various factors affecting the practical capacity.                             | 5 M | CO6 | Analyse              |

(OR)

- |     |    |  |     |     |                      |
|-----|----|--|-----|-----|----------------------|
| 12. | a) | Explain the cause's for road accidents in detail.  | 5 M | CO6 | Analyse & Evaluate   |
|     | b) | Define the term PCU and explain factors effecting. | 5 M | CO6 | Understand & Analyse |

Time: 3 Hours

Max Marks: 60

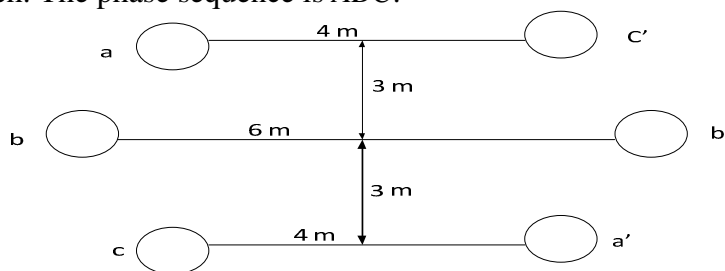
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

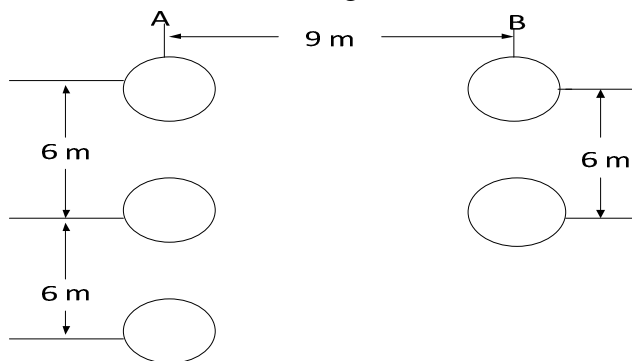
**UNIT-I**

- |  | Marks | CO | Blooms Level  |
|--|-------|----|---------------|
| 1. a) Derive the capacitance of a 3-phase overhead line with symmetrical spacing.  | 5     | 1  | Understanding |
| b) Find the inductance per phase per km of double circuit 3-ph line shown in fig. The conductors are transposed and are of radius 0.75 cm each. The phase sequence is ABC. | 5     | 1  | Applying      |



(OR)

- |  |   |   |               |
|--|---|---|---------------|
| 2. a) Discuss the concepts of self GMD and mutual GMD by deriving the equations of transmission lines.   | 5 | 1 | Understanding |
| b) Determine the inductance of a single phase line consisting of three conductors of 3 mm radii in the go conductor and two conductors of 6 mm in return conductor. The configuration as shown in figure | 5 | 1 | Applying      |

**UNIT-II**

- |   |   |   |               |
|---|---|---|---------------|
| 3. a) Derive the transmission line efficiency and regulation for medium transmission line $\pi$ - model with suitable equations and diagram.  | 5 | 2 | Understanding |
| b) A short 3-phase transmission line has a series impedance per phase of $(20+j50)$ ohm. The line delivers a load of 50 MW at 0.7 p.f. lag. Find the A,B,C,D parameters of line and its efficiency. | 5 | 2 | Applying      |

(OR)

- |  |   |   |               |
|--|---|---|---------------|
| 4. a) Prove that $AD-BC=1$ ,<br>Where A,B,C,D are the transmission parameters of line  | 5 | 2 | Understanding |
| b) A three-phase 50 Hz transmission line is 80 km long. The voltage at receiving end is 220 kV. The line parameters are $r = 0.025$ ohm/km, $x = 0.4$ ohm/km, $y = 2.8 \times 10^{-6}$ mho/km. Find the sending end current and sending end voltage. | 5 | 2 | Applying      |

### UNIT-III

5. a) Represent A, B, C and D constants for long transmission line represented by Equivalent- $\pi$ . 5 3 Understanding  
b) A 3-phase, 50 Hz, 132 kV transmission line of 100 km long has the following distributed parameters:  
 $R = 0.1\Omega/\text{km}$ ,  $L = 0.2 \text{ mH}/\text{km}$ ,  $C = 0.04 \times 10^{-4} \text{ F}/\text{km}$ ,  
Determine the sending end voltage & current when delivering 50MVA at 0.8 pf lag. 5 3 Applying

(OR)

6. Derive the sending end voltage and current for long lines using rigorous solution. 10 3 Understanding

### UNIT-IV

7. a) Explain what do you understand by Skin Effect and Proximity Effect. 5 Understanding  
b) Describe the voltage and current waves when the line is connected to a cable. 5 Analysing

(OR)

8. a) What do you mean by skin depth. How it depends on Skin Effect and line parameters. Define Ferranti effect. 5 Understanding  
b) Discuss a short note on line compensation. 5 Understanding

### UNIT-V

9. a) What is string efficiency? Discuss methods to improve it. 5 Understanding  
b) Determine the voltage across each disc of suspension insulators as a percentage of line voltage to earth. The self and capacitance to ground of each disc is C and 0.2C. The capacitance between the link pin and guard ring is 0.1C, Also determine the string efficiency if three discs are connected. 5 Applying

(OR)

10. a) Derive an expression for capacitance between the guard ring and the pin of each unit. 5  
b) Discuss about the grading of cables. 5 Understanding

### UNIT-VI

11. a) Develop an expression for the sag of the line when the line is suspended between two supports at unequal levels. 5 Understanding  
b) Determine the corona loss of a three-phase, 160 km long line whose conductor diameter is 1.036 cm, spaced at 2.44 m ( $\Delta$ ), and operates at 110 kV at 50 Hz. Air density  $\delta$  is given as 0.957 and disruptive voltage is 54.72 kV line to neutral. 5 Applying

(OR)

12. a) Explain the phenomenon of corona, the factors affecting corona loss. Discuss how to prevent it. 5 Understanding  
b) Estimate the weight of the copper required for a three phase transmission line supplying at 380kV to a load of 100MW at a lagging power factor of 0.9. The length of line is 150 km. The neutral point is earthed and efficiency is 92%. The resistance of conductor 1 km long and 1 sq cm cross section is 0.045 ohm. One  $\text{cm}^3$  of copper weighs 0.01 kg 5 Applying

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

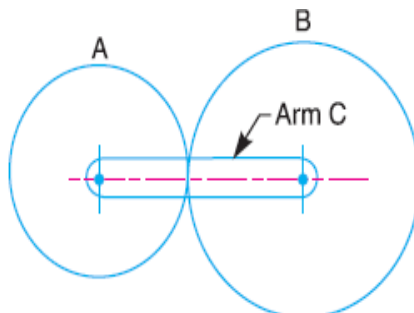
		Marks	CO	Blooms Level
1.	a) Define Inversion of mechanism. Explain any two inversions of single slider crank chain.	7	1	2
	b) Give examples of : (i) lower pair & higher pair (ii) turning and rolling pair.	3	1	2
	(OR)			
2.	a) What are the different types of constrained motions and explain?	5	1	2
	b) How the pairs are classified? Explain in detail.	5	1	2

**UNIT-II**

3.	The crank of a slider crank mechanism rotates clockwise at a constant speed of 300rpm. The crank is 150mm and connecting rod is 600mm long. Determine the following when the crank makes an angle of $45^\circ$ from inner dead centre position. (i) Linear velocity of the slider. (ii) Angular velocity of connecting rod	10	2	4
	(OR)			
4.	In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 rad/s clockwise lengths of the links are AB = 60mm; BC = CD = 70 mm; DA = 120 mm. When angle DAB = $60^\circ$ and both B and C lies on the same side of AD, find angular velocities of BC and CD;.	10	2	4

**UNIT-III**

5.	Two involute gears of $20^\circ$ pressure angle are in mesh. The number of teeth on Pinion is 20 and the gear ratio is 2. The teeth have module is 5 mm, assuming addendum as standard and equal to one module. Find i) length of path of contact                      ii) Arc of contact iii) Angle of action of pinion and gear	10	3	3
	(OR)			
6.	In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anti clockwise direction about the centre of gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B?	10	3	3



#### **UNIT-IV**

7. In a vertical double acting steam engine, the connecting rod is 4.5 times the crank. The weight of the reciprocating parts is 120kg and the stroke of the piston is 440 mm. The engine runs at 250 rpm, if the net load on the piston due to steam pressure is 25 kN when the crank has turned through an angle of  $120^\circ$  from the top dead centre, determine the (i) thrust on the bearings (ii) pressure on the slide bars (iii) tangential force on the crank pin and (iv) turning moment on the crank shaft

**(OR)**

8. The turning moment diagram for a multi cylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm =  $3^\circ$  horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows : + 52, - 124, + 92, - 140, + 85, - 72 and + 107 mm<sup>2</sup>, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed  $\pm 1.5\%$  of the mean, find the necessary mass of the flywheel of radius 0.5 m.

#### **UNIT-V**

9. In an engine governor of the Porter type, the upper and lower arms are 200 mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each flyball is 2 kg and friction of the sleeve together with the resistance of the operating gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are  $30^\circ$  and  $40^\circ$ , find, taking friction into account, range of speed of the governor

**(OR)**

10. a) Describe the working of Shoe brake with a neat diagram 5 5 2  
b) Describe the working of internal expanding brake with neat diagram 5 5 2

#### **UNIT-VI**

11. An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. State also the effect if the aeroplane turns to its right instead of to the left.

**(OR)**

12. The turbine rotor of a ship has a mass of 20 tonnes and a radius of gyration of 0.75 m. Its speed is 2000 rpm clockwise looking from stern. The ship pitches  $6^\circ$  above and below the horizontal position. The time period is 18 seconds. Determine the maximum gyroscopic couple and its effect when the bow is raising and also determine the maximum angular acceleration

**III B.Tech I Semester Regular Examinations, January-2023  
LINEAR AND DIGITAL IC APPLICATIONS  
(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

	<u><b>UNIT-I</b></u>	Marks	CO	Blooms Level
1.	a) Expound the parameters that should be considered for ac and dc applications of an Op-Amp.	5M	CO1	L3
	b) For an op-amp PSRR is 70dB (min), CMRR is $10^5$ and $A_d = 10^5$ . The output voltage changes by 20V in 4 sec. Calculate (i) common mode gain (ii) slew rate.	5M	CO1	L2
	(OR)			
2.	a) Draw a neat circuit diagram of an integrator circuit. Explain its functioning with the Input-Output wave forms.	5M	CO1	L1
	b) Explain the Op_Amp summer circuit with a neat diagram.	5M	CO1	L3
	<u><b>UNIT-II</b></u>			
3.	a) Sketch the block diagram of log Amplifiers and explain its operation in detail.	5M	CO2	L2
	b) Design a stable multi vibrator using 555 timer for a frequency of 1KHz and a duty cycle of 70%. Assume $C = 0.1 \mu F$ .	5M	CO2	L3
	(OR)			
4.	a) Explicit the operation of monostable multivibrator using 555 timer and also derive the expression for frequency of oscillation.	5M	CO2	L2
	b) Produce the circuit diagram by explaining the operation of the Schmitt trigger.	5M	CO2	L3
	<u><b>UNIT-III</b></u>			
5.	a) Attain a band pass filter for cut off frequencies 500 Hz and 1.5 kHz with a pass band gain of 4.	5M	CO3	L2
	b) Compare the merits and demerits of different types of D/A converters. If the maximum output voltage of a 9-bit DAC is 25.4 V, what is the smallest change in the output as the binary count increases?	5M	CO3	L2
	(OR)			
6.	a) Summarize the characteristics of All pass filter.	5M	CO3	L3
	b) Discuss the R-2R ladder used in digital to analog conversion using suitable mathematical expressions.	5M	CO3	L2
	<u><b>UNIT-IV</b></u>			
7.	a) Design CMOS transistor circuit for 2-input NOR gate. With the help of function Tables explain the operation of the circuit diagram.	5M	CO4	L3
	b) Exemplify the differences between TTL, ECL & CMOS logic family.	5M	CO4	L2
	(OR)			
8.	a) Obtain the circuit diagram of basic TTL NAND gate and explain the three parts with the help of functional operation.	5M	CO4	L1
	b) Illustrate the operation of Emitter coupled logic.	5M	CO4	L2
	<u><b>UNIT-V</b></u>			
9.	a) Explain about 3 to 8 decoder using IC 74X138,	5M	CO5	L2
	b) Contrast about Quad two inputs multiplexer using IC 74X157 with logic diagram, including pin numbers for a standard 16-pin dual in-line package.	5M	CO5	L2
	(OR)			
10.	a) Realize the logic diagram for the 74x148 8-input priority encoder, including pin numbers for a standard 16-pin dual in-line package.	5M	CO5	L3
	b) Interpret the Structure of one stage of a carry lookahead adder.	5M	CO5	L2
	<u><b>UNIT-VI</b></u>			
11.	Present a synchronous 4-bit binary counter with parallel enable logic using IC 74X163.	10M	CO6	L2
	(OR)			
12.	Design a basic four-bit, Johnson counter using IC 74LS194 with timing diagram and states.	10M	CO6	L3

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**  
(AUTONOMOUS)

**III B.Tech I Semester Regular Examinations, January, 2023**

**SOFTWARE ENGINEERING**  
(Computer Science and 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

	<u><b>UNIT-I</b></u>	Marks	CO	Blooms Level
1. Discuss user and system requirements		(10M)	CO1	K2
	<b>(OR)</b>			
2. Explain Requirement validation		(10M)	CO1	K2
	<u><b>UNIT-II</b></u>			
3. Explain about Evolutionary process modes		(10M)	CO2	K2
	<b>(OR)</b>			
4. Discuss extreme programming		(10M)	CO2	K2
	<u><b>UNIT-III</b></u>			
5. Explain design quality		(10M)	CO3	K2
	<b>(OR)</b>			
6. Explain user interface design process		(10M)	CO3	K2
	<u><b>UNIT-IV</b></u>			
7. What is the necessity of unit testing? Write down all unit test considerations		(10M)	CO4	K2
	<b>(OR)</b>			
8. Explain boundary value analysis		(10M)	CO4	K2
	<u><b>UNIT-V</b></u>			
9. Describe metric for analysis model		(10M)	CO5	K2
	<b>(OR)</b>			
10. Discuss COCOMO model		(10M)	CO5	K2
	<u><b>UNIT-VI</b></u>			
11. Justify the statement software maintenance is costlier		(10M)	CO6	K3
	<b>(OR)</b>			
12. Illustrate quick-fix model		(10M)	CO6	K3



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**Marks CO Blooms  
Level

1. a) Explain Moor and Mealy machines with examples.
- b) Construct a DFA that accepts Set of all strings with three consecutive 0's

5	1	2
5	1	3

(OR)

2. a) Consider the following NFA. Compute the NFA equivalent DFA

5	1	3
---	---	---

	a	b	c
→T	{T,P}	{P,R}	{}
P	{T,P,R}	{}	{R}
*R	{}	{T,P}	{T,P,R}

- b) Compare the transition functions of DFA, NFA by above example.

5	1	2
---	---	---

**UNIT-II**

3. a) Give the regular expressions for the following language over alphabet {a, b}.
  - a. Set of all strings with substring bab or abb.
  - b. Set of all strings whose 3rd symbol is 'a' and 5th symbol is 'b'.

5	2	3
---	---	---

- b) Which of the following languages is regular? Justify.(Using Pumping Lemma)
  - i)  $L=\{a^m b^n \mid m>n\}$
  - ii)  $L=\{a^n b^n \mid n \geq 1\}$

5	2	3
---	---	---

(OR)

4. a) Explain minimization of DFA with suitable example.
- b) Discuss in detail about the closure properties of regular sets.

5	2	3
5	2	2

### UNIT-III

5. a) Define Chomsky Normal Form and Greibach Normal Form in reference to CFG. Give a suitable example of each. 5 3 2
- b) Construct the following grammar into Chomsky Normal Form.  
 $S \rightarrow abSb \mid a \mid aAb$   
 $A \rightarrow bS \mid aAAb \mid \varepsilon$  5 3 3

(OR)

6. a) G denotes the context-free grammar defined by the following rules.  $S \rightarrow ASB/ab/SS$   $A \rightarrow aA/A$  ,  $B \rightarrow bB/A$   
Give a left most and right most derivation of aaabb in G. 5 3 3
- b) If G is the grammar  $S \rightarrow Sbs/a$ , Show that G is ambiguous. 5 3 3

### UNIT-IV

7. a) Demonstrate the working of TM with an example. 5 4 2
- b) Prove that if L is  $N(M1)$  for some PDA  $M1$  then L is  $L(M2)$  for some PDA  $M2$ . 5 4 3

(OR)

8. a) Construct a PDA from the following CFG.  
 $G = (\{S, X\}, \{a, b\}, P, S)$   
where the productions are –  $S \rightarrow XS \mid \varepsilon$  ,  $A \rightarrow aXb \mid Ab \mid ab$  5 4 3
- b) Describe the Equivalence of CFL and PDA with suitable example. 5 4 3

### UNIT-V

9. a) Describe the Turing machines with multiple tape, multiple track and storage in state. 5 5 2
- b) Design a Turing Machine to compute  $f(m+n)=m+n$ ,  $\forall m,n \geq 0$  and simulate their action on the input 0100. 5 5 3

(OR)

10. Construct a Turing Machine that recognizes the language  $\{0^n 1^n / n \geq 1\}$  10 5 3

### UNIT-VI

11. a) Explain Chomsky Hierarchy language. 5 6 3
- b) Deep describe Linear Bound Automata with suitable example. 5 6 3

(OR)

12. a) Define PCP Problems. Explain PCP with suitable example. 5 6 2
- b) Explain class P & NP with examples. 5 6 3

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) Explain working principle of non-recording type rain gauge with a neat sketch, mentioning its advantages and disadvantages 6M  
b) Write short notes on 6M  
i) Intensity Frequency Duration Analysis of Rainfall data.  
ii) Depth Area Duration Analysis of Rainfall data.

**(OR)**

2. a) Define Evaporation? Discuss the factors affecting the evaporation from a catchment area? 6M  
b) A 6hr storm produced rainfall intensities of 7, 18, 25, 12, 10 and 3mm/hr in successive One hour intervals over a basin of 800sq.km. The resulting runoff is observed to be 2640 hect meters. Determine  $\phi$  - index for the basin. 6M

**UNIT-II**

3. a) Explain a procedure of deriving a D-h UH from the complex storm hydrograph of the catchment. 6M  
b) Define hydrograph. Draw a single-peaked hydrograph and indicate its various components. State the significance of the inflection point on the recession side of the hydrograph. 6M

**(OR)**

4. a) Define unit hydrograph theory with its assumption. Describe the various steps involved in calculating the depth of runoff. 6M  
b) The peak of flood hydrograph due to a 3-h duration isolated storm in a catchment is  $270\text{m}^3/\text{s}$ . The total depth of rainfall is 5.9 cm. Assuming an average infiltration loss of 0.3cm/h and a constant base flow of  $20\text{m}^3/\text{s}$ , estimate the peak of the 3-h unit hydrograph of this catchment. If the area of the catchment is 567 km<sup>2</sup> determine the base width of the 3-h unit hydrograph assuming it to be triangular in shape. 6M

**UNIT-III**

5. a) Derive the expression for aquifer constant 'T' from a fully penetrating confined aquifer. 6M  
b) Describe constant level pumping test for an open well. 6M

**(OR)**

6. a) Derive an expression to determine the rate of flow through unconfined aquifer using Theim's equation. 6M  
b) Calculate the discharge from a tube well of 20-cm diameter penetrating fully into a confined aquifer of 20-m thick and having a permeability of 40 m/day. The drawdown in the well is 3 m and zero drawdown at 300 m from the well. If the diameter of the well is doubled, find the percentage increase in the yield, the other conditions remaining the same. 6M

**UNIT-IV**

7. a) Define duty, delta and base period? Derive the relation? 6M  
b) Define consumptive use? Explain different methods of estimating consumptive use? 6M

**(OR)**

8. a) Explain the different types of irrigation practices adopted in India. 6M  
b) Explain briefly about irrigation efficiencies. 6M

**UNIT-V**

9. a) Design of irrigation canals by Kennedy's theory. 6M  
b) Explain the classification of canals. 6M

**(OR)**

10. a) Write a note on selection of suitable type of cross-drainage works. 6M  
b) Design an irrigation channel section for the following data: discharge = 30 cumecs; silt factor = 1.0; side slopes = 1/2 : 1, Determine the longitudinal slope also. 6M

# AR18

**CODE: 18EET311**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, January, 2023**

**MICROPROCESSORS AND MICROCONTROLLERS**

**(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) What is a register? Discuss the register organization of 8086 microprocessor. 6M  
b) Discuss about the interface signals of the 8086 processor in maximum mode. 6M
- (OR)**
2. a) Explain the pins of 8086 with a neat sketch. 6M  
b) Draw and explain the read and write timing diagram of 8086 microprocessor. 6M

## **UNIT-II**

3. a) Explain the Data transfer Instructions of 8086 6M  
b) Explain the following instructions of 8086 microprocessor 6M
  - i. MOVS
  - ii. JMP
  - iii. INT
- (OR)**
4. a) Explain the Arithmetic Instructions of 8086 6M  
b) Write a assembly program to ADD two 16 bit numbers using 8086. 6M

## **UNIT-III**

5. a) With a neat block diagram, explain the interfacing of 8259A. 8M  
b) Write about 8257 DMA controller 4M
- (OR)**
6. a) Explain the block diagram and the functions of each block of the 8251 USART 12M

## **UNIT-IV**

7. a) Difference Between Paging and Segmentation. 6M  
b) Write about data types of 80386 Processor. 6M
- (OR)**
8. a) Explain the ARM processor Architecture . 8M  
b) Explain interrupt vector table in ARM? 4M

## **UNIT-V**

9. a) Explain the memory organization of 8051. 6M  
b) Explain the different addressing modes in 8051? 6M
- (OR)**
10. a) Explain the architecture of 8051 Microcontroller with a neat diagram. 8M  
b) List out the applications of microcontrollers. 4M

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) Explain different types of constrained motions of kinematic pairs with examples 4M
- b) A crank & slotted lever mechanism, the forward to return ratio of the quick return mechanism is 2:1. If the radius of the crank is 120 mm, then find the distance between the crank centre to lever centre point. Also find the length of the stroke, if the length of the slotted lever is 350 mm and the line of the stroke passes through the extreme positions of the free end of the lever. 8M

(OR)

2. a) What is a machine? Giving example, differentiate between a machine and a structure. 5M
- b) Write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketch. 7M

### UNIT-II

3. a) What is Grashof's law of four bar mechanism? Explain the different inversion obtain in four bar mechanism. 6M
- b) Explain the inversion of a single slider crank chain. Explain the quick return mechanism inversion with a neat sketch. 6M

(OR)

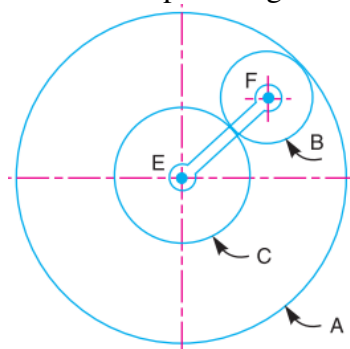
4. a) Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain? 4M
- b) Quick return mechanism of the oscillating link type, for a special purpose machine. The driving crank is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of is 120 mm, determine the dimensions of fixed link and oscillating lever. 8M

### UNIT-III

5. a) Classify the tooth wheel according to position of axes. 6M
- b) Define the terms used in gear profile on the sketch 6M
- (a) Pitch circle diameter (b) Pitch point (c) Pressure angle

(OR)

6. a) An epicyclic gear consists of three gears A, B and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m. If the gear A is fixed, determine the speed of gears B and C. 8M



- b) What are the advantages of involute gears over cycloidal gears? 4M

**UNIT-IV**

7. a) Discuss the Dynamic force analysis of slider crank mechanism. 6M  
b) Explain the terms: variation of Tractive force, swaying couple, and hammer blow. 6M

**(OR)**

8. a) State the four useful applications of the gyroscopic action. 4M  
b) The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 rpm clockwise when viewed from the front. The radius of gyration of the rotor is 320 mm. Determine the gyroscopic couple and its effect when (i) the Ship turns right at a radius of 250 m with a speed of 25km/hr, (ii) Ship pitches with the bow rising at an angular velocity of 0.8 rad/s, (iii) Ship rolls at an angular velocity of 0.1 rad/s 8M

**UNIT-V**

9. a) State the applications of Flywheel. 4M  
b) Write notes on following: i) Turning moment diagram ii) Coefficient of fluctuation of speed. 8M

**(OR)**

10. a) What is the function of a governor? What are the limitations of governor? 4M  
b) Each arm of a Porter governor is 250 mm long. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation. Each ball has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125mm and 150 mm. 8M

**UNIT-I**

1. a) Outline various ideal and practical specifications of an op-amp **6 M**  
b) Define slew rate. If the response to a square wave input, the output of an op-amp changes from -12V to +12V over a time interval of 0.5 $\mu$ s. Find the slew of the op-amp. **6 M**

**(OR)**

2. a) Draw the block diagram of an op-amp and explain the necessity of each block. **6 M**  
b) Draw the circuit diagram of practical integrator using an op-amp and explain its frequency response. **6 M**

**UNIT-II**

3. a) With the help of necessary input and output waveforms, explain the operations of comparator. **6 M**  
b) Explain the functional block diagram of IC 555 timer. **6 M**

**(OR)**

4. a) Explain the operation of logarithmic amplifier. **6 M**  
b) Describe the operation of a monostable multivibrator using IC 555 and derive expression for time period of quasistable state. **6 M**

**UNIT-III**

5. a) Design a first order Butterworth high pass filter for a high cut-off frequency of 2 KHz and pass band gain of 4. **6 M**  
b) Construct the circuit diagram of flash type ADC and explain its operation. **6 M**

**(OR)**

6. a) Develop a 3-bit R-2R ladder DAC and explain its operation. **6 M**  
b) Summarize about RC active filters. **6 M**

**UNIT-IV**

7. a) Draw and explain the CMOS inverter. **6 M**  
b) Explain how a full adder is realized using two half adders. **6 M**

**(OR)**

8. a) Design a 32 to 1 multiplexer using four 74 $\times$ 151 multiplexers and 74 $\times$ 139 decoder. **6 M**  
b) Explain the operation of TTL NAND gate with the help circuit diagram and functional table. **6 M**

**UNIT-V**

9. a) Compare latch and flip-flop. **6 M**  
b) With the functional diagram and truth table explain the operation of SR flip-flop. **6 M**

**(OR)**

10. a) Mention the types of shift registers and explain any one register with the help of diagram. **6 M**  
b) Design a mod-12 asynchronous counter. **6 M**

# AR18

**CODE: 18CST311**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, January,2023**

**SOFTWARE ENGINEERING**

**(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) Define Software Engineering. What are the goals of Software Engineering? Explain 6M  
b) Describe Software myths in detail. 6M  
(OR)
2. a) Why is Software Engineering a Layered technology? Explain 6M  
b) What are the requirements for elicitation and analysis of an ATM System? Discuss 6M

## **UNIT-II**

3. a) Describe the role of risk analysis in evolutionary process models like the spiral model 6M  
b) What is a prototype? Explain the process of prototype development with a diagram. Mention the benefits of using a prototype. 6M  
(OR)
4. a) Explain briefly about the scrum process model, 6M  
b) Differentiate between Context Models and Behavioural models in detail. 6M

## **UNIT-III**

5. a) Discuss various design concepts in detail. 6M  
b) Explain briefly the software architecture style and architecture patterns. 6M  
(OR)
6. a) Explain about interface analysis and interface design steps with an example. 6M  
b) Describe the golden rules for interface design. List three principles that should be applied when building any Web application user interface. 6M

## **UNIT-IV**

7. a) Differentiate between Verification and Validation testing techniques. 6M  
b) Why is regression testing an important part of any integration testing procedure? Justify 6M  
(OR)
8. a) Describe the differences between behavioural- testing and white-box testing 6M  
b) What is Cyclomatic complexity? Explain with an example of how to construct a flow graph for a program (Fibonacci series) and also compute its Cyclomatic complexity. 6M

## **UNIT-V**

9. a) Describe COCOMO II Model with an example. 6M  
b) Explain the metrics for a software project 6M  
(OR)
10. a) Write short notes on (i) Software Reviews (ii) Formal Technical Reviews(FTR) 6M  
b) What do you mean by Statistical Software Quality Assurance(SSQA)? Explain 6M



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) Explain different types constrained motions with neat 6 M sketches?  
b) What is the inversion of mechanism? Explain all the 8 M inversions of double slider crank chain with neat sketches.

**(OR)**

2. a) Explain Hart's mechanism and prove that it transmits exact 7 M straight line motion?  
b) Define mechanism and machine. Explain the Whitworth 7 M quick return motion mechanism with neat sketch?

## UNIT-II

3. A mechanism of a crank and slotted lever quick return motion 14M is shown in Fig.1. If the crank rotates counter clockwise at 120 r.p.m., determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. Crank,  $AB = 150$  mm ; Slotted arm,  $OC = 700$  mm and link  $CD = 200$  mm.

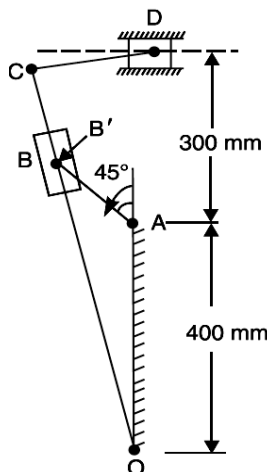


Figure 1

**(OR)**

4. a) State the Kennedy's theorem? Locate all the instantaneous centers of the slider crank mechanism as shown in Fig.2. The lengths of crank  $OB$  and connecting rod  $AB$  are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: **1.** Velocity of the slider  $A$ , and **2.** Angular velocity of the connecting rod  $AB$ . 7M

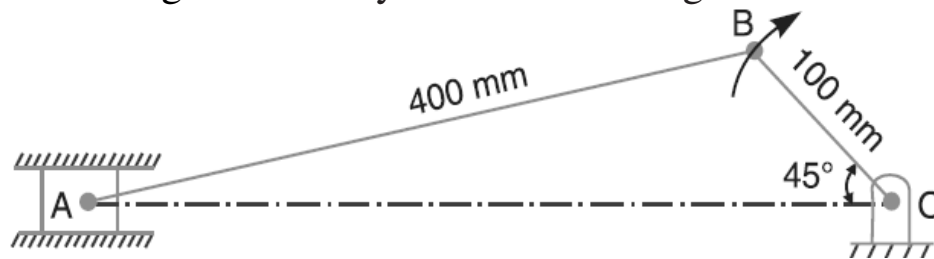


Figure 2

- b) In a slider crank mechanism, the length of crank  $OB$  and connecting rod  $AB$  are 125 mm and 500 mm respectively. The centre of gravity  $G$  of the connecting rod is 275 mm from the slider  $A$ . The crank speed is 600 r.p.m. clockwise. When the crank has turned  $45^\circ$  from the inner dead centre position, determine: 1. velocity of the slider  $A$ , 2. velocity of the point  $G$ , and 3. angular velocity of the connecting rod  $AB$ . 7M

### UNIT-III

5. a) Derive an expression for the angular acceleration of the connecting rod of a reciprocating engine? 7M  
b) What do you mean by spin, precession and gyroscopic planes and derive the Gyroscopic couple? 7M

(OR)

6. a) The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: 7M  
1. When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.  
2. When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.  
b) Derive the total Gyroscopic couple acting on two wheeler when it takes a turn? 7M

## UNIT-IV

7. a) Derive the expression for law of gearing? 4M  
b) A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 r.p.m. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are  $20^\circ$  involute form, addendum length is 5 mm and the module is 5 mm. 10M  
Also find the angle through which the pinion turns while any pairs of teeth are in contact.

(OR)

8. a) Explain the differential gear of an automobile with neat sketch? 4M  
b) In a reverted gear train, as shown in Fig. 3, two shafts A and B are in the same straight line and are geared together through an intermediate parallel shaft C. The gears connecting the shafts A and C have a module of 2 mm and those connecting the shafts C and B have a module of 4.5 mm. The speed of shaft A is to be about but greater than 12 times the speed of shaft B, and the ratio at each reduction is same. Find suitable number of teeth for gears. The number of teeth of each gear is to be a minimum but not less than 16. Also find the exact velocity ratio and the distance of shaft C from A and B 10M

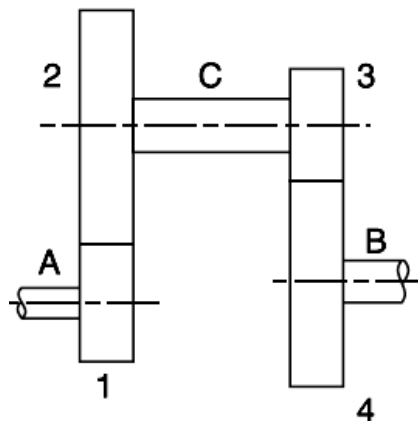


Fig.3

## UNIT-V

9. a) Explain the turning moment diagram of multi cylinder engine with neat sketch. 7M
- b) An engine flywheel has a mass of 6.5 tones and the radius of gyration is 2m. If the maximum and minimum speeds are 120 rpm and 118 rpm respectively. Find maximum fluctuation of energy. 7M

**(OR)**

10. a) What is the function of a governor? 4M
- b) In a porter governor, the upper and lower arms are each 250mm long and are pivoted on the axis of rotation. The mass of each rotating ball is 3kg and the mass of the sleeve is 20kg. The sleeve is in its lowest position when the arms are inclined at  $30^\circ$  to the governor axis. The lift of the sleeve is 36mm. Find the force of friction at the sleeve, if the speed at the moment is falls from the highest position. Also find the range of speed of the governor. 10M

4 of 4

\*\*\*

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) Describe the characteristics of software. List out the software application domains which are challenging for software engineers. [8M]
- b) Explain in detail about Software myths. How to avoid them and find the correct solutions. [6M]

**(OR)**

2. a) Discuss the steps involved in waterfall model Explain with a neat diagram?. List out the advantages and disadvantages?. [8M]
- b) What is software process improvement?. Explain how the capability maturity model integration will improve organizations capabilities and maturity levels?. [6M]

**UNIT-II**

3. a) Outline the features of Software Requirement Specification template?. [8M]
- b) Explain collaborative requirements and quality function deployment?. [6M]

**(OR)**

4. a) What is structured language specification?. Draw a graphical model for ATM for withdrawal of amount. [8M]
- b) Differentiate between context model and behavioural model with simple examples. [6M]

**UNIT-III**

5. a) Describe the four basic design principles in component level design used in Object Oriented Software Engineering?. [7M]
- b) Compare and contrast architectural design elements versus interface design elements? [7M]

**(OR)**

6. a) Draw the architectural context diagram for the safe home security function and explain how to refine the system?. [8M]
- b) Explain User Interface analysis and design process with a neat diagram?. [6M]

**UNIT-IV**

7. a) Describe software testing strategies with a neat diagram and mention the criteria for completion testing. [8M]
- b) List different types of debugging strategies. What is automated debugging?. [6M]

**(OR)**

8. a) Describe the important attributes of effective software metrics. What are functions based metrics? [7M]  
b) Explain the important features of latest constructive cost model for project effort estimation using object points?. [7M]

### **UNIT-V**

9. a) Define software risk?. What are the steps involved in risk identification and risk projection?. [8M]  
b) Summarize the elements of software quality assurance and mention its goals and metrics. [6M]

(OR)

10. a) Explain Mc Call's quality factors with a neat diagram? [8M]  
b) What is RMMM?. Explain in detail how it is used as a document for the risk analysis?. [6M]

# AR13

CODE: 13EC3018

SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, January-2023

SIGNALS AND SYSTEMS  
(Electrical and Electronics Engineering)

Time: 3 Hours

Max Marks: 70

## PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) Find the impulse response  $h(n)$  for the following causal LTI discrete time system  $y(n) = x(n) - 2x(n-2) + x(n-3)$ . [
- b) Define Unit step function. How do you obtain unit impulse function from it?
- c) Determine the sequence  $x(n)$  whose Z-transform is given by  $X(Z) = (1+2Z)(1+3Z^{-1})(1-Z^{-1})$
- d) State with reasons if the following function is periodic. In case of periodic find the period  $x(t) = a \sin 4t + b \cos 7t$ .
- e) show that Inductor is Time Invariant.
- f) Plot  $u(\sin t)$ .
- g) What is the relation between laplace transform and Continuous time fourier transform?
- h) What is the condition for the system to become stable?
- i) Find the Z-transform of  $x(n) = \{1, 2, -4, 5, 6\}$ ?
- j) State duality of fourier transform?

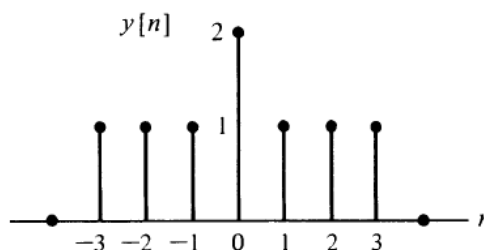
## PART-B

Answer one question from each unit

[5x12=60M]

### UNIT-I

2. a) Find the signal  $x[n]$  such that  $\text{even}\{x[n]\} = y[n]$  for  $n \geq 0$ , and  $\text{odd}\{x[n]\} = y[n]$  for  $n < 0$ . **6M**



- b) Find whether the given signals are energy signals, power signals or neither (1)  $x[n]=2e^{j3n}$  6M

(2)  $x(t)=Ae^{at}u(t)$

(OR)

3. a) List the properties of a LTI system and explain each property with an example. 6M  
b) Determine the convolution sum of two sequences. 6M

$$x(n) = \left\{ 1, \underset{\uparrow}{4}, 3, 2 \right\}$$

$$h(n) = \left\{ \underset{\uparrow}{1}, 3, 2, 1 \right\}$$

## UNIT-II

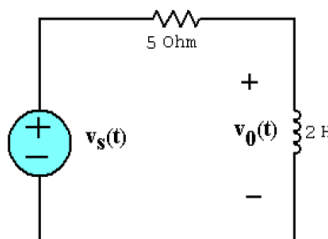
- 4 a) State and prove the following Fourier series properties. 6M  
(i) Time shift  
(ii) Frequency shift  
b) Find the exponential Fourier series coefficients of 6M  
 $x(t)=\cos 2t+\sin 3t+\cos(5t+60^\circ)$

(OR)

- 5 a) Determine the exponential Fourier series from trigonometric Fourier series? 6M  
b) The circuit shown in figure has non sinusoidal voltage source  $V_s(t)$  6M  
that has Fourier

$$series V_s(t) = \frac{1}{2} + \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{\sin(2n-1)\pi t}{2n-1} . Find the voltage across inductor and correspond.$$

magnitude spectrum





### UNIT-III

6. a) Find the Fourier transform of the following and sketch Magnitude and Phase spectrum **6M**

(i)  $e^{at}u(-t)$   $a>0$  (ii)  $t e^{-at}u(t)$   $a>0$

- b) Explain the development of Fourier transform from Fourier series **6M**

(OR)

7. a) state and prove duality property and Differentiation property of Fourier transform. **6M**

- b) Find the Fourier transform of the signal  $g(t) = \frac{4t}{(1+t^2)^2}$  **6M**

### UNIT-IV

8. a) State and prove initial and final value theorem of Laplace Transform. **6M**

- b) L.T  $\{h(t)\} = \frac{1}{s^2 - s - 42}$ , Find Inverse laplace Transform such that system is i) Causal ii) Stable iii) Anti-causal **6M**

(OR)

9. a) Find the I.L.T  $\{ \log(s+a)/(s+b) \}$  using differentiation property **6M**

- b) A system described by a differential equation is given by  $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = x(t)$  and system is initially at rest. Find the Step Response? **6M**

### UNIT-V

10. a) Solve the following difference equation for  $y(n)$  using z-transform and the specified initial condition **6M**

$$y(n) - y(n-1) + \frac{1}{4}y(n-2) = x(n); n \geq 0 \quad y(-1)=2 \quad \text{and} \quad y(-2)=4.$$

where  $x(n) = 2\left(\frac{1}{8}\right)^n$

- b) Find the inverse z-transform of **6M**

$$X(Z) = \frac{1}{1 - 1.5Z^{-1} + 0.5Z^{-2}} \text{ for ROC: } 0.5 < |Z| < 1$$

(OR)

11. a) Determine the z-transform and region of convergence for the following sequence: **6M**

$$x(n) = \begin{cases} 2^n & n \geq 0 \\ 3^{-n} & n < 0 \end{cases}$$

- b) Find the convolution between  $x(n) = \{1, 2, 3, 4\}$  and  $y(n) = \{4, 3, 2, 1\}$  using Z-transform. **6M**

4 of 4

\*\*\*