

## (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) Describe hydrologic cycle from engineering perspective. 5M  
 b) A catchment has five rain gauge stations. In a year the annual rainfall recorded by the gauges are 78.8cm, 90.2 cm, 98.6 cm, 102.4cm and 70.4 cm. With a 6% error for the estimation of mean rainfall, determine the additional number of gauges. 5M

Marks CO Blooms Level

CO1 apply  
CO1 apply

(OR)

2. a) Explain Isohyetal method to find average precipitation in a given catchment. 5M  
 b) Describe the working of floating type recording rain gauge with the help of a neat sketch. 5M

CO1 apply  
CO1 rememberUNIT-II

3. a) Explain evaporation reduction methods from a water body. 5M  
 b) What is evaporation if 4.75 liters of water is removed from an evaporation pan of diameter 1.22 m and the simultaneous rainfall measurement is 8.8 mm. 5M

CO2 apply  
CO2 apply

(OR)

4. a) Differentiate between PET and AET. 5M  
 b) Explain Blaney-Criddle formula for estimating Evapotranspiration. 5M

CO2 apply  
CO2 applyUNIT-III

5. a) Explain the construction of flood Hydrograph from the given unit hydrograph. 5M  
 b) The following are the rates of rainfall for successive 20 min period of 140 min storm. 5M  
 2.5, 2.5, 10, 7.5, 1.25, 1.25 and 5 cm/hr. Taking  $\phi$ -index as 3.2 cm/hr, determine the direct runoff and total rainfall.

CO3 create  
CO3 apply

(OR)

6. a) Define S-Hydrograph 2M  
 b) Given the ordinates of a 4-h unit hydrograph as below, derive the ordinates of a 12-h unit hydrograph for the same catchment. 8M

CO3 apply  
CO3 Understand

Time(h)	0	4	8	12	16	20	24	28
Ordinates of 4h UH (m <sup>3</sup> /s)	0	20	80	130	150	130	90	52

#### **UNIT-IV**

7. a) What are the different geological formations? Briefly explain about each one. 7M CO4 create  
b) Show that porosity is equal to the sum of specific yield and specific retention. 3M CO4 create
- (OR)**
8. a) Derive the equation for steady state flow through a well-constructed in unconfined aquifer. 5M CO4 apply  
b) During a recuperation test, the water in an open well depressed by pumping by 2.1m and it is recuperated 1.6m in 90 minutes. Find the diameter of the well to yield 10 liters per second under depression head of 2m. 5M CO4 Analyse

#### **UNIT-V**

9. a) Define duty and delta. 2 M CO5 create  
b) The field capacity and permanent wilting point for a given soil are 33 and 14% respectively. Determine the storage capacity of soil within the root zone of the soil which may be taken as 80 cm. At a given time the soil moisture in the field is 18% and a farmer applies 26 cm of water. What part of this water would be wasted? Assume porosity of soil as 40% and relative density as 2.65. 8 M CO5 apply
- (OR)**
10. a) List and Explain various Irrigation Efficiencies. 5M CO5 Evaluate  
b) What are the causes of Water logging? Briefly mention about their effects and remedial measures. 5M CO5 apply

#### **UNIT-VI**

11. Design a channel for Discharge (Q) = 40 cumecs and silt factor (f) =1 using Lacey's method. side slope  $1\frac{1}{2} : 1$  10 M CO6 Understand  
CO6 Analyse
- (OR)**
12. a) Explain the advantages and disadvantages of canal lining. 5M CO6 create  
b) Explain the various losses in canals. 5M CO6 Evaluate

Time: 3 Hours

Max Marks: 60

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**UNIT-I**Marks CO Blooms  
Level

1. a) Draw and find the number of states in the minimized DFA that accepts the language defined by the regular expression **(a+b)\*abb** using Thomson and Subset Construction Methods or direct conversion method.

10 M 1 K3

(OR)

2. a) Explain in detail about Input Buffering in lexical analyser with its types
- b) Explain the phases of compiler in brief and show the translation of the given statement:  $p = i + r * 60$

5M 1 K2

5M 1 K2

**UNIT-II**

3. a) For the following grammar

 $D \rightarrow T L;$  $L \rightarrow L, id \mid id$  $T \rightarrow int \mid float$ 

- (a) Remove left recursion and left factoring (if required)

10 M 2 K3

- (b) Find first () and follow () for each non-terminal for the resultant grammar

- (c) Construct LL (1) parsing table

- (d) Parse the following string (show stack actions clearly) and draw parse tree for the input: **int id, id;**

(OR)

4. a) To check whether the given grammar is ambiguous or not

 $S \rightarrow SS \mid AB$ 

5M 2 K3

 $A \rightarrow Aa \mid a$  $B \rightarrow Bb \mid b$ 

To check whether the given grammar present with immediate left recursion. If so, then eliminate it.

5M 2 K3

 $S \rightarrow (L)a$  $L \rightarrow L, S \mid S$

### UNIT-III

5. a) Construct an operator relation table and operator function table for the following grammar and check whether the given input “(id^id+id\*id)” is accepted by the operator precedence parser or not.

$E \rightarrow E + E$

$E \rightarrow E * E$

$E \rightarrow E^E$

$E \rightarrow id$

$E \rightarrow (E)$

10M      3      K6

(OR)

6. a) Construct Canonical LR (0) items for SLR (1) parser for the context free grammar

$S \rightarrow A S \mid b$

$A \rightarrow S A \mid a$

7M      3      K6

- b) Summarize the concept of shift-reduce parsing

3M      3      K2

### UNIT-IV

7. a) Construct the Syntax Directed Translation (SDT) action for the Four Function Calculator grammar and draw the parse tree for the given input: 23-42\*87+7

5M      4      K3

- b) Illustrate Syntax Tree and DAG for  $a = (a + b * c) / (b * c) + b * c$

5M      4      K2

(OR)

8. a) Determine the semantic rules for the following context free grammar.

$L \rightarrow E$

$E \rightarrow E1 + T$

$E \rightarrow T$

$T \rightarrow T1 * F$

$T \rightarrow F$

$F \rightarrow (E)$

$F \rightarrow \text{digit}$

5M      4      K5

- b) Determine the semantic rules for the following context free grammar.

$E \rightarrow E * T$

$E \rightarrow T$

$T \rightarrow F - T$

$T \rightarrow F$

$F \rightarrow 2$

$F \rightarrow 4$

5M      4      K5

## UNIT-V

9. a) Evaluate the no. of basic block and draw the control flow graph for the given three- address code.

### 3 Address Code:

1. if (A < C) goto (3)
2. goto (15)
3. if (B > D) goto (5)
4. goto (15)
5. if (A = 1) goto (7)
6. goto (10)
7. T1 = c + 1
8. c = T1
9. goto (1)
10. if (A <= D) goto (12)
11. goto (1)
12. T2 = A + B
13. A = T2
14. goto (10)
15. ....  
.....

5M      5      K5

- b) Explain in detail about representation of declaration statements in intermediate code generator

5M      5      K5

(OR)

10. a) Explain the Back-patching process for the following expression:  
**p < q or r < s and t < u**

10M      5      K5

## UNIT-VI

11. a) Explain peephole optimization for the following code: **a = b+c**

5M      6      K5

- b) Explain the various issues involved in the design of code generation

5M      6      K5

(OR)

12. a) Construct the Target Machine code for the following C Program

```
void main()
{
    int b;
    int a;

    b = 3;
    a = 12;
    a = (b + 2) - (a*3)/6;
}
```

10M      6      K3

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

Answer ONE Question from each Unit

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All parts of the Question must be answered at one place

<u><b>UNIT-I</b></u>		Marks	CO	Blooms Level
1.	a) Explain about dominant and degenerate modes in a Rectangular Waveguide.	5M	1	3
	b) List out the characteristics and advantages of microwaves?	5M	1	2
<b>(OR)</b>				
2.	a) Deliberate and derive the cut- off frequency of a Rectangular Waveguide.	5M	1	3
	b) An air-filled wave guide operates at 7 GHz. The dimensions of the Waveguide are 3 cm X 2 cm. Calculate: i) $f_c$ ii) $V_p$ iii) $\lambda_g$ .	5M	1	1
<u><b>UNIT-II</b></u>				
3.	a) Construe about the coupling mechanism through probe technique.	5M	2	3
	b) Outline about Faraday rotation and write its use in microwave applications?	5M	2	2
<b>(OR)</b>				
4.	a) What is Scattering matrix? Write its significance and list out the properties of scattering matrix	5M	2	1
	b) Explicit the working principle of a Directional coupler?	5M	2	3
<u><b>UNIT-III</b></u>				
5.	a) Interpret about the power output and frequency characteristics of a reflex Klystron Oscillator?	5M	3	3
	b) Present the limitations of conventional tubes at microwave frequencies.	5M	3	2
<b>(OR)</b>				
6.	a) Illustrate about velocity modulation and explain it with necessary equations in Klystron amplifier.	5M	3	2
	b) Derive the expression for power output and efficiency for a 2-cavity Klystron amplifier.	5M	3	2
<u><b>UNIT-IV</b></u>				
7.	a) What is meant by slow wave structure? List out the various slow wave structures.	5M	4	1
	b) Derive the expression for Hull cut-off voltage equation of cylindrical magnetron.	5M	4	3
<b>(OR)</b>				
8.	a) Sketch and explain the working of Magnetron in $\pi$ -mode.	5M	4	2
	b) Expound the suppression of oscillations in TWT.	5M	4	3

### **UNIT-V**

- |             |    |   |    |   |   |
|-------------|----|---|----|---|---|
| 9.          | a) | Explicate the principle of operation in PIN diode.  | 5M | 5 | 3 |
|             | b) | How is avalanche effect utilized to generate microwave signals?<br>Explain the operation of IMPATT diode. | 5M | 5 | 2 |
| <b>(OR)</b> |    |   |    |   |   |
| 10.         | a) | Elucidate about Modes in Gunn diode.  | 6M | 5 | 2 |
|             | b) | Categorize the differences between TED's and conventional transistors?                                    | 4M | 5 | 2 |

### **UNIT-VI**

- |             |    |   |    |   |   |
|-------------|----|---|----|---|---|
| 11.         | a) | Using microwave test bench setup, Explain the measurement of Power.               | 5M | 6 | 3 |
|             | b) | Exemplify the procedure of measurement of low VSWR.                               | 5M | 6 | 3 |
| <b>(OR)</b> |    |   |    |   |   |
| 12.         | a) | Justify how is slotted line used for measurement of impedance of an unknown load? | 5M | 6 | 3 |
|             | b) | Paraphrase about Attenuation Measurement.   | 5M | 6 | 2 |

III B.Tech II Semester Regular Examinations, May, 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

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) Explain the functions of different registers in 8086. Also discuss about flag register contexts.	5M	1	Understand
	b) Discuss the read and write cycle timing diagrams of 8086 in minimum mode.	5M	1	Understand
	(OR)			
2.	a) Draw the functional pin diagram of 8086 microprocessor and explain how they are classified.	5M	1	Understand
	b) Describe the response of 8086 processor, when interrupt coming on INTR.	5M	1	Analyze
	<u>UNIT-II</u>			
3.	a) Write an 8086-assembly language program to find the GCD of two 16-bit unsigned integers.	5M	2	Understand
	b) What is MACRO? What are the differences between a MACRO & subroutine?	5M	2	Understand
	(OR)			
4.	a) Write an assembly language program to find the smallest byte among 5 bytes.	5M	2	Applying
	b) Explain 8086 arithmetic & logical instructions.	5M	2	Understand
	<u>UNIT-III</u>			
5.	a) Draw and discuss the internal architecture of 8259A.	5M	3	Understand
	b) Draw the functional block diagram of USART (8251)	5M	3	Applying
	(OR)			
6.	a) Write an assembly language program in 8086 to generate a symmetrical square wave with 1KHz frequency? Give the necessary circuit set up with a DAC.	5M	3	Applying
	b) Discuss the procedure for processing of interrupts by 8259.	5M	3	Understand
	<u>UNIT-IV</u>			
7.	a) What are the Features of 80386 microprocessor? And what are the Operating modes of 80386?	5M	4	Understand
	b) Draw and explain the Architecture of 80386 Microprocessor with neat diagram?	5M	4	Understand
	(OR)			
8.	a) Distinguish between 80486 and 80386 microprocessors. (Any four points)	5M	4	Understand
	b) What are the basic features of 80486? What are the operating modes of the processor?	5M	4	Understand
	<u>UNIT-V</u>			
9.	a) Describe register structure of ARM in detail.	5M	5	Understand
	b) Explain ARM Processor exceptions and modes along with a block diagram.	5M	5	Understand
	(OR)			
10.	a) Describe implementation of branch, call and return instructions in ARM instruction set.	5M	5	Understand
	b) Explain pipeline operation in ARM architecture.	5M	5	Understand
	<u>UNIT-VI</u>			
11.	a) List and explain the functions of all special function registers in 8051?	5M	6	Understand
	b) Distinguish general purpose registers and special function registers with examples.	5M	6	Understand
	(OR)			
12.	a) Define addressing mode? Explain addressing modes supported by 8051 MC, with example for each?	5M	6	Understand
	b) Illustrate the memory organization of 8051 microcontrollers.	5M	6	Understand



Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

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All parts of the Question must be answered at one place

		Mark s	CO	Bloo ms Level
<b><u>UNIT-I</u></b>				
1.	Explain all the phases of a compiler using the expression position:=initial +rate*60	10	1	2
<b>(OR)</b>				
2 a	Write differences between compiler and interpreter.	5	1	
b	Construct a DFA for the set of all strings that starts and ends with the same symbol over $\Sigma = \{a, b\}$	5	1	3
<b><u>UNIT-II</u></b>				
3. a	Show that the grammar is ambiguous. $S \rightarrow SS / a / b$	5	2	3
b	Check whether the following grammar is LL(1) grammar. $S \rightarrow iEtS / iEtSeS / a$ $E \rightarrow b$	5	2	3
<b>(OR)</b>				
4	Construct the predictive parser for the given grammar $E \rightarrow E + T / T$ $T \rightarrow T * F / F$ $F \rightarrow (E) / id$	10	2	3
<b><u>UNIT-III</u></b>				
5.	Construct SLR parse table for the given grammar $E \rightarrow E+T/T$ $T \rightarrow T*F/F$ $F \rightarrow (E)/id$	10	3	3
<b>(OR)</b>				
6 a	List all LR(0) items for the following grammar $S \rightarrow AS / b$ $A \rightarrow SA / a$	5	3	1
b	Discuss in brief about the stack implementation in SLR Parser.	5	3	

#### UNIT-IV

7. List the different ways in which three address code is implemented using the following statement. 10 4 1
- a:= b\* -c + b\* -c**

**(OR)**

- 8 a Write a syntax directed definition for a simple desk calculator that performs addition and multiplication. 5 4 2
- b Write the three address code sequence for the statement a or b and not c 5 4 2

#### UNIT-V

9. a Explain in brief about Equivalence of Type expression. 5 5 2
- b Explain in brief about Type Checking and Type Conversion 5 5 2

**(OR)**

- 10 a Explain the role of type checking in error detection and recovery. 5 5 2
- b List the data structures used for symbol tables and explain any one of them. 5 5 1

#### UNIT-VI

- 11 a Write a short note on basic blocks 5 6 1
- b Design DAG for the following basic block:  
D:=B – C  
E:=A+B  
B:=B+C  
A:=E – C 5 6 3

**(OR)**

- 12 a Discuss the design issues of Code Generator. 5 6 2
- b Write the algorithm for basic blocks 5 6 2

Time: 3 Hours

Max Marks: 60

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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	(a) What are the basic assumptions made while using Fourier's law of heat conduction.	3	CO1	I
	(b) Derive the generalized heat conduction equation in Cartesian coordinates and reduce it to different forms	7	CO1	II
<b>(OR)</b>				
2.	(a) Derive an expression for overall heat transfer coefficient for a concentric hollow cylinder subjected to convection at its outer and inner surfaces.	3	CO1	I
	(b) A composite slab consisting three layers of fire brick, red brick and cement plaster is used as a wall boundary to a boiler furnace. Hot gases at 645°C with $h$ equal to 84 W/m <sup>2</sup> K are present at inner side of the wall (towards fire brick). Outer wall is exposed to ambient air at 40°C with $h$ equal to 12 W/m <sup>2</sup> K. Thickness of fire brick, red brick and cement plaster is equal to 15 cm, 8 cm and 1 cm respectively. Considering thermal conductivity of fire brick, red brick and cement plaster as 0.56 W/mK, 0.32 W/mK and 0.012 W/mK respectively, calculate	7	CO1	III
	(i) Conduction heat transfer per m <sup>2</sup> cross sectional area of the wall,			
	(ii) Temperature gradient across each material in the composite slab.			
<b>UNIT-II</b>				
3.	(a) Derive the general heat conduction equation in an extended surface (or fin) and mention various applicable boundary conditions.	3	CO2	I
	(b) A long circular fin with 1.25 cm diameter and 5 cm in length is attached to a base maintained at 145°C. The fin is made with pure copper as material. If the fin is exposed to a fluid at 32°C and $h$ equal to 24 W/m <sup>2</sup> K, calculate	7	CO2	III
	(i) Heat transfer from the fin, (ii) Fin efficiency and (iii) Fin effectiveness.			
<b>(OR)</b>				
4.	(a) Describe the significance of Heisler and Grober charts with neat sketches.	3	CO2	II
	(b) A long cylinder made of Stainless Steel (AISI 316) is initially at a temperature of 220°C. It is suddenly placed in a liquid at 50°C with convection coefficient equal to 154 W/m <sup>2</sup> K. The diameter of the cylinder is 7.5 cm and length is 30 cm. Calculate,	7	CO2	III
	(i) Centreline temperature after 1.5 minutes,			
	(ii) Surface temperature and total heat transfer after 1.5 minutes			
<b>UNIT-III</b>				
5.	(a) Explain the basic steps involved while applying Buckingham's $\Pi$ theorem.	3	CO3	II
	(b) Prove that $Nu = f\{Re, Pr\}$ in case of forced convection from a horizontal circular tube using Rayleigh's method of dimensional analysis.	7	CO3	III

(OR)

6. (a) Write the physical significance of following non-dimensional numbers i) Nusselt number ii) Prandtl number iii) Grashoff number 3 CO3 I
- (b) An electric bulb with a surface temperature equal to 80°C is placed in stagnant atmospheric air at 30°C. The bulb is approximated as a cylindrical tube with diameter equal to 5 cm and length 50cm. Calculate the heat lost from the bulb to air. 7 CO3 III

**UNIT-IV**

7. (a) Define the following in case of internal flow through a pipe, 3 CO4 I
- (i) Boundary layer thickness, (ii) Thermal entrance length.
- (b) Water at a temperature of 10°C and velocity 0.5 m/s is allowed to pass through a circular pipe of diameter 2.54 cm. The pipe surface is maintained at a constant temperature of 120°C. The length of the pipe is considered as 150 cm. Calculate 7 CO4 III
- (i) Heat transfer coefficient and
- (ii) Heat transfer rate for a water outlet temperature is equal to 50°C.

(OR)

8. (a) What are the differences between pool boiling and film boiling? 3 CO4 I
- (b) Describe various stages of pool boiling with a neat sketch. 7 CO4 II

**UNIT-V**

9. (a) Derive an expression for LMTD of a concentric pipe heat exchanger running parallel flow mode. 5 CO5 II
- (b) Water at a flow rate of 1.45 kg/s, enters a concentric pipe heat exchanger at a temperature of 25°C and leaves at 55°C. It is heated by a lubricating oil ( $C_p = 2340 \text{ J/kgK}$ ) at a flow rate of 2.1 kg/s and entering the heat exchanger at a temperature of 100°C. Calculate, 5 CO5 III
- (i) Exit temperature of the lubricating oil,
- (ii)  $\Delta T_{\text{LMTD}}$  (iii) Effectiveness of the heat exchanger.

(OR)

10. A one shell four tube pass shell tube heat exchanger operates with Water ( $C_p = 4100 \text{ J/kgK}$ ) as shell fluid and Ethylene Glycol ( $C_p = 2980 \text{ J/kgK}$ ) as tube fluid. Water enters the heat exchanger at 2.45 kg/s and 32°C and Ethylene glycol at 1.52 kg/s and 124°C. Calculate: 10 CO5 IV
- (i) Heat transfer between the two fluids, and
- (ii) Exit temperature of both the fluids.
- Considering  $U = 3246 \text{ W/m}^2\text{K}$  and  $A = 1.25 \text{ m}^2$ .

**UNIT-VI**

11. (a) Define 3 CO6 I
- (i) Radiation shape factor and (ii) Kirchhoff's law of radiation.
- (b) Two infinite concentric cylinders exchange radiation between them. They are maintained at a constant temperature of 1000°C (cylinder 1) and 250°C (cylinder 2) respectively with their respective emissivity equal to 0.45 (cylinder 1) and 0.54 (cylinder 2). Considering diameter of cylinder 1 and 2 are 10 cm and 12 cm respectively, calculate the net radiation heat exchange between the two cylinders. 7 CO6 III

(OR)

12. (a) Define Fick's law of diffusion 3 CO6 I
- (b)  $\text{N}_2$  diffuses through a 15 mm thick aluminium wall. The concentration of  $\text{N}_2$  in the aluminium at the inner surface is  $1.25 \text{ kmol/m}^3$  while its concentration at the outer surface is negligible. If the binary diffusion coefficient for  $\text{N}_2$  in aluminium is  $0.2548 \times 10^{-12} \text{ m}^2/\text{s}$ , what is the diffusion flux for  $\text{N}_2$  through the aluminium? 7 CO6 III

# AR16

**CODE: 16CE3017**

**SET-1**

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

**III B.Tech II Semester Supplementary Examinations, May, 2023**

**WATER RESOURCE ENGINEERING**

**(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) Explain various methods of determining average Rainfall over a basin and also discuss the suitability of each method. 7M
- b) Table below gives the time distribution of rainfall lasting for 8 hours. If the direct runoff is 10 cm, determine  $\phi$  – Index of the storm and time of rainfall excess. 7M

Time (Hours)	1	2	3	4	5	6	7	8
Rainfall in each hour (cm)	0.6	1.5	2.5	3.5	3.0	2.5	2.0	0.7

**(OR)**

- 2 a) Define S- curve Hydrograph? How it is derived? 6M
- b) Table below gives ordinates of 3-hr Unit Hydrograph. Derive ordinates of flood Hydrograph if a rainfall of 60 mm produced in three hours duration. Consider initial losses as 5 mm and infiltration rate 5 mm/hr. Assume constant base flow  $10 \text{ m}^3/\text{s}$ . 8M

Time(Hrs)	0	3	6	9	12	15	18	21	24
Ordinates of 3 -hr UH ( $\text{m}^3/\text{s}$ )	0	10	20	30	40	30	20	10	0

## UNIT-II

3. a) Explain various types of Aquifers. 6M
- b) During a recuperation test, the water in open well was depressed by pumping by 2.5 m and it recuperated 1.8 m in 70 minutes. Find i) yield from a well of 5 m diameter under a depression head of 3 m ii) the diameter of the well to yield 10 litres/second under a depression head of 2m. 8M

**(OR)**

4. a) Explain the following terms: 8M
- i) Storage coefficient ii) Coefficient of Transmissibility
- iii) coefficient of permeability iv) specific yield
- b) A well penetrates fully on 20m thick water bearing stratum of medium sand having coefficient of permeability of  $0.001 \text{ m/s}$ . the well radius is 10cm and is to be worked under a drawdown of 5m at the well face. Calculate the discharge from the well. What will be the % increase in the discharge if the radius of the well is doubled? 6M

### UNIT-III

5. a) Explain the factors to be considered for selecting the site of a reservoir. 6M  
b) The amount of water flowing from a certain catchment area at the proposed dam site during the twelve months of a year in million cubic meters are: 2.8, 4.2, 5.6, 18.4, 22.6, 22.6, 19.8, 8.4, 7.1, 7.1, 5.6, 5.6. Find the minimum capacity of reservoir required if water is to be drawn at a uniform rate and no water is allowed to spill over. 8M

(OR)

6. a) Describe the classification of storage of a reservoir into various zones. 6M  
b) The following information is available regarding the relationship between trap efficiency and capacity-inflow ratio. 8M

C/I	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Trap Efficiency (%)	86	92	93	94	95	96	97	97	97	97.5

Find the probable life of reservoir with an initial reservoir capacity of 30 MCM, if the average annual flood inflow is 60 MCM and the average annual sediment inflow is 1,50,000 tonnes. Assume specific weight of the sediment equal to 1.2 gm/cc. The useful life of reservoir will terminate when 80% of its initial capacity is filled with sediment.

### UNIT-IV

7. a) Explain with neat sketches the different methods of irrigation. 8M  
b) After how many days will you supply water to field in order to get efficient irrigation, If field capacity of soil is 25%, permanent wilting point is 15%, density of soil =1.5g/cc, effective depth of root zone is 75cm, and daily consumptive use of water for the crop is 10mm. 6M

(OR)

8. a) Define duty. Discuss various factors effecting duty and illustrate different methods to improve duty. 7M  
b) The left branch canal carrying a discharge of 20 cumecs has culturable command area of 20,000 Ha. The intensity of Rabi crop is 80 percent, and the base period is 120 days. The right branch canal carrying a discharge of 8 cumecs has culturable command area of 12,000 Ha, intensity of irrigation of Rabi crop is 50 percent, and base period is 120 days. Compare the efficiencies of the two canal systems. 7M

### UNIT-V

9. a) Define water logging. Explain the causes of water logging and note the remedial measures. 6M  
b) Design an irrigation canal based on Lacey's theory for the following data: 8M  
Design discharge =  $Q = 50 \text{ m}^3/\text{sec}$   
Silt factor =  $f = 1.0$  , Side slope =  $\frac{1}{2} : 1$

(OR)

10. a) Explain different types of outlets and requirements of good outlet. 6M  
b) Design an irrigation channel to carry a discharge of  $45 \text{ m}^3/\text{sec}$ . assume  $N=0.0225$ , critical velocity ratio (m)=1, and the channel has a bed slope of 0.16m/km. 8M

# AR16

**CODE: 16ME3018**

**SET-1**

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

**III B.Tech II Semester Supplementary Examinations, May, 2023**

**DESIGN OF MACHINE MEMBERS – II  
(MECHANICAL 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) Difference between the analysis of stresses in thin & thick cylinders 6M
- b) Derive a Clavarino's Equation for cylinders with closed end & made of ductile material 8M

**(OR)**

2. Design a piston for a single acting four-stroke engine for the following data. Fuel Consumption 0.15 kg/ brake power/hr, Indicated mean effective pressure of 0.75 N/mm<sup>2</sup>. The maximum gas pressure in the cylinder is 5 N/mm<sup>2</sup> at a speed of 2000 rpm. HCV of fuel = 42 x 10<sup>3</sup> KJ/kg, cylinder bore is 100 mm, stroke= 125mm. Assume any data required within limits. 14M

## UNIT-II

3. Design a connecting rod for the petrol engine from the following data  
Diameter = 110 mm; Mass of the reciprocating parts= 2 kg  
Length of the connecting rod=325mm; Stroke=150mm  
Speed=150 rpm with possible over speed upto 2500 rpm  
Compression ratio= 4:1 ; Maximum explosion pressure=205 MPa  
Assume any data missing 14M

**(OR)**

4. Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder engine for the following data: Bore = 400 mm ; Stroke = 600 mm ; Engine speed = 200 r.p.m. ; Mean effective pressure = 0.5 N/mm<sup>2</sup>; Maximum combustion pressure = 2.5 N/mm<sup>2</sup>; Weight of flywheel used as a pulley = 50 kN; Total belt pull = 6.5 kN. When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1N/mm<sup>2</sup> and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design. 14M

### UNIT-III

5. a) Derive an expression for Length of Open belt drive. 6M  
b) A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 r.p.m. The angle of contact is spread over  $\frac{11}{24}$  of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is  $1100 \text{ kg / m}^3$  and the related permissible working stress is 2.5 MPa. 8M
- (OR)
6. a) List out advantages of chain drives over the belt drives. 6M  
b) Design a chain drive to transmit power of 15KW from electric motor the speed of the motor shaft is 970r.p.m and compressor is to be run at 330r.p.m. compressor operates in 2 shafts the minimum Centre distance should be 550mm. design a suitable chain drive. 8M

### UNIT-IV

7. a) Derive an expression for Wear strength of Spur Gear teeth. 6M  
b) A gear drive required to transmit maximum power is 22.5KW. The velocity ratio is 1:2 and speed of pinion is 200r.p.m the applied Centre distance between the shafts is 600mm. the teeth has  $20^\circ$  step involute teeth profile. The static stresses for both the materials (gear & pinion) are 60Mpa. Face width is 10times thee module. Find  
i. Module  
ii. Face width  
iii. No. of teeth on each gear and pinion  
Check the design for dynamic and wear load. The deformation or dynamic factor in Buckingham equation is 80 and material combination factor for the wear is 1.4. 8M  
Take the members are steady load and working 8hrs/day.
- (OR)
8. a) Derive an expression for Strength of Helical Gear teeth. 6M  
b) With help of neat sketch, explain how an axial thrust is generated in a Helical gear. 8M

### UNIT-V

9. a) Differentiate Static load carrying capacity and dynamic load carrying capacity. 4M  
b) A single row deep groove ball bearing is subjected to a radial force of 8kN and a thrust force of 3KN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75mm and bearing No.6315 (C=112000N) is selected for this application. (i) Estimate the life of this bearing, with 90% reliability (ii) Estimate the reliability for 20000 hr life. 10M
- (OR)
10. a) Explain in detail about properties of lubricants. 4M  
b) Following data is given for a  $360^\circ$  hydrodynamic bearing: radial load = 5.5 KN journal speed = 1800 rpm journal diameter = 90 mm bearing length = 100 mm radial clearance = 0.05 mm viscosity of lubricant = 28cP Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate: (i) coefficient of friction; (ii) power lost in friction; (iii) minimum oil film thickness;(iv) flow requirement in liters/min; and (v) temperature rise. 10M



# AR18

**CODE: 18CET315**

**SET-1**

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

**III B.Tech II Semester Supplementary Examinations, May, 2023**

**Transportation Engineering-I  
(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) Discuss the role of highway transportation 6 M  
b) Compare different modes of transportation 6 M  
(OR)
2. a) Explain the factors affecting alignment 6 M  
b) Discuss the necessity of highway planning 6 M

## **UNIT-II**

3. a) Derive the expression for overtaking sight distance 6 M  
b) Design the rate of superelevation for the horizontal highway curve of radius 750m and speed 80kmph 6 M  
(OR)
4. a) Discuss various gradients used in vertical alignment of highways 6 M  
b) An ascending gradient of 1 in 120 meets a descending gradient of 1 in 100. A summit curve is to be designed for a speed of 80kmph so as to have an overtaking sight distance of 450m. 6 M

## **UNIT-III**

5. a) What are the technical specifications of aggregate impact test? 6 M  
b) Discuss the requirements of design mix 6 M  
(OR)
6. a) Write about shape test of aggregate. 6 M  
b) Explain the Marshall method of mix design 6 M

## **UNIT-IV**

7. a) Discuss the construction procedure of earthen road 6 M  
b) Compare various aspects of tie and dowel bars 6 M  
(OR)
8. a) Discuss various maintenance of highways 6 M  
b) Explain the various distresses in rigid pavement. 6 M

## **UNIT-V**

9. a) Explain the preventive measures for accidents 6 M  
b) Discuss the advantages of grade separated intersection 6 M  
(OR)
10. a) Discuss the relation between Volume, Speed and Density 6 M  
b) Explain the methodology for parking studies 6 M

# AR18

**CODE: 18CST313**

**SET-1**

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

**III B.Tech II Semester Supplementary Examinations, May, 2023**

**Compiler Design  
(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

## UNIT-I

1. a) State the reasons for separating Lexical analysis and Syntax analysis. 6
- b) Describe the lexical errors and various error recovery strategies with suitable examples. 6

**(OR)**

2. a) Discuss about the Syntax Error Handling. 6
- b) List the pros and cons of bootstrapping. 6

## UNIT-II

3. a) Discuss in brief about LL(1) Grammars. 6
- b) Differentiate between Top down and bottom up parsing techniques 6

**(OR)**

4. a) Explain the structure of LR parsers. How they are different from LL parsers? 6
  - b) Construct LALR Parsing table for the grammar 6
- $S \rightarrow L = R / R,$   
 $L \rightarrow *R / id,$   
 $R \rightarrow L$

## UNIT-III

5. a) Explain the type system in type checker? Write the syntax directed definition for type checker. 6
- b) List the differences between runtime stack and heap storage allocation. 6

**(OR)**

6. a) Explain about Symbol table organization techniques 6
- b) What is syntax directed translation? How it is different from translation schemes? Explain with an example. 6

## UNIT-IV

7. a) What are some challenges that developers might face when optimizing code, and how can they overcome them? 6
- b) How can you measure the effectiveness of data flow analysis techniques in optimizing code performance? 6

**(OR)**

8. a) List the properties of optimizing compilers. 6
- b) What are the principle sources of optimization? Give the classification of code optimization. 6

## UNIT-V

9. a) What are the various machine dependent code optimization techniques? 6
- b) How do generic code generation algorithms work, and what benefits can they offer in terms of code portability and maintainability? 6

**(OR)**

10. a) What is object code, and how is it generated from source code during the code generation phase of compilation? 6
- b) Can you provide an example of a real-world application where code generation techniques were used to improve performance, portability, or security? 6

# AR18

**CODE: 18EET316**

**SET-2**

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

**III B.Tech II Semester Supplementary Examinations, May, 2023**

**INDUSTRIAL AUTOMATION  
(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) Briefly explain the function of necessary components of Automation system. 6M
- b) Explain how to choose suitable automation systems for the utility. What influences the Hardware configurations in the automation? 6M

**(OR)**

2. a) List and explain the control and sensing elements in the Industrial Automation. 6M
- b) List and explain the advantages and limitations of Industrial Automation 6M

**UNIT-II**

3. a) Describe special I/O Modules of PLC. 6M
- b) What are the different types of Programmable Logic Controllers. 6M

**(OR)**

4. a) Draw and explain the main block diagram of PLC. 6M
- b) State and explain advantages and disadvantages of PLC in details. 6M

**UNIT-III**

5. a) Explain different types of PLC ladder symbols. 6M
- b) Briefly explain the procedure for the construction of plc ladder diagrams? 6M

**(OR)**

6. a) Explain different types of PLC programming methods. 6M
- b) Write a PLC program for the control of traffic lights in one direction and explain the sequence of events involved. 6M

**UNIT-IV**

7. a) Explain latching with one example. 6M
- b) Define timers and counters. Explain how timers and counters work in ladder logic programs. 6M

**(OR)**

8. a) Describe the development of addition and multiplications functions using PLC ladder diagrams. 6M
- b) Explain the diagrams of upcounter and down counters. Mention their applications. 6M

**UNIT-V**

9. a) Explain SCADA architecture in detail. 6M
- b) Explain master terminal unit in SCADA 6M

**(OR)**

10. a) State advantages and disadvantages of SCADA systems. 6M
- b) Explain how SCADA is implemented in water purification system. 6M

# AR18

**CODE: 18MET314**

**SET-1**

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

**III B.Tech II Semester Regular (RA) / Supplementary Examinations, May, 2023**

**DESIGN OF MACHINE MEMBERS - II  
(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) Discuss the design procedure for pressure vessel subjected to higher external pressure. 12

**(OR)**

2. a) What are the desirable properties of Cylinder materials? 2  
b) The following data are given for the piston of a four-stroke diesel engine: 10  
Cylinder bore = 250 mm  
Material of piston rings = Grey cast iron  
Allowable tensile stress =  $100 \text{ N/mm}^2$   
Allowable radial pressure on cylinder wall = 0.03 Mpa  
Thickness of piston head = 42 mm  
Number of piston rings = 4  
Calculate:  
(i) radial width of piston rings;  
(ii) axial thickness of piston rings;  
(iii) width of top land;  
(iv) width of rings grooves;  
(v) thickness of piston barrel; and  
(vi) thickness of barrel at open end.

**UNIT-II**

3. a) Why are connecting rods made of I – sections? 2  
b) Determine the dimensions of cross-section of the connecting rod for a diesel engine with the following data: 10  
Cylinder bore = 100 mm  
Length of connecting rod = 350 mm  
Maximum gas pressure = 4 Mpa  
Factor of safety = 6

**(OR)**

4. Design the crank pin, and the left and right hand crank web for a plain carbon steel centre crankshaft for a single acting four-stroke single cylinder engine for the following data: 12  
Bore = 400 mm;  
Stroke = 600 mm;  
Engine speed = 200 r.p.m.;  
Mean effective pressure =  $0.5 \text{ N/mm}^2$ ;  
Maximum combustion pressure =  $2.5 \text{ N/mm}^2$ ;  
Weight of the flywheel used as pulley = 50 kN;  
Total belt pull = 6.5 kN.  
*Assume any other data required for the design.*

### **UNIT-III**

5. a) List out the advantages and disadvantages of power screw. 6  
b) Describe the application of power screw 6

**(OR)**

6. a) Write the advantage of V- belt drive over Flat belt drive. 4  
b) Describe the design criteria of selection of Flat Belt Drives 8

### **UNIT-IV**

7. a) A pair of spur gears with  $20^\circ$  full depth involute teeth consists of a 20 teeth pinion meshing with the 41 teeth gear. The module is 3 mm. While the face width is 40 mm. The material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm<sup>2</sup>. The gears are heat-treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. 12

**(OR)**

8. a) Give an illustration of helical gear along with the suitable nomenclature 4  
b) Deduce the expression for static, limiting wear load and dynamic load for helical gear. 8

### **UNIT-V**

9. a) The load on the journal bearing is 150 kN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following: 12  
1. Length of bearing if the allowable bearing pressure is 1.6 N/mm<sup>2</sup>, and  
2. Amount of heat to be removed by the lubricant per minute, if the bearing temperature is 60°C and viscosity of the oil is 60° C is 0.02 kg/m-s and the bearing clearance is 0.25 mm.

**(OR)**

10. a) Write short note on basic modes of lubrication in bearing with suitable sketches 6  
b) What is the significance of Petroff equation? 6

2 of 2

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