

**DESIGN OF CONCRETE STRUCTURES  
(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) Derive the expression for limiting moment of resistance of singly reinforced balanced section. 7M
  - b) Write about design philosophies used in the design of RC structures. 7M
- (OR)**
2. A singly reinforced concrete beam has a width 250mm and overall depth 550 mm with a clear cover of 50mm is reinforced with 5 bars of 20mm diameter. Find the flexural strength and hence the safe u.d.l on the simply supported beam of span 5m. Use M30 concrete and Fe 415 steel. 14M

**UNIT-II**

3. Design for flexure and shear, a rectangular beam of cross section 300mmx500mm with an effective span of 7m. Width of the support on each side shall be 300mm. The superimposed load on the beam is 50KN/m. Use M25 concrete and Fe415 steel. Calculate the reinforcement at mid span section. And find minimum and maximum shear zones. Draw the reinforcement details accordingly. 14M
- (OR)**
4. A-T beam has flange dimensions of 1100x120mm. The width of rib is 250mm and rib depth is 350mm. If the beam is reinforced with 2000 mm<sup>2</sup> of steel in tension zone with an effective cover of 40mm, determine the maximum allowable u.d.l inclusive of self weight over a simply supported span of 6m. M25 grade concrete and Fe415 steel is used. 14M

**UNIT-III**

5. A simply supported slab is resting on 230 mm thick masonry walls on all four sides. If the room dimensions are 4.0 m x 6.0 m, design the slab for live load 2 KN/m<sup>2</sup> and floor finishes 1.0 KN/m<sup>2</sup>. Use M25 grade concrete and Fe415 grade steel and also sketch the reinforcement details. Assume corners are held down. 14M
- (OR)**
6. Design the slab for a hall has internal dimensions of 12 m x 4 m. The slab is supported by 230 mm wide beams with 4 m centre to centre having a live load of 3.5 KN/m<sup>2</sup> and floor finish of 1KN/m<sup>2</sup>. Consider concrete of grade M20 and HYSD steel of grade Fe500. The thickness of brick masonry walls is 300mm. Draw reinforcement detail. 14M

#### **UNIT-IV**

7. Design a square column of size 400mmx400mm carrying a factored load of 14M 1200KN and the factored moments  $M_{ux}=150\text{KN-m}$  and  $M_{uy}=170\text{KN-m}$ . Take the moments due to minimum eccentricities are less than the applied moments. Use  $f_{ck}=20\text{N/mm}^2$  and  $f_y=415\text{N/mm}^2$ .
- (OR)**
8. Design a R.C. Circular column section to carry a characteristic load of 1500 kN. Provide spiral reinforcement as transverse reinforcement. Adopt M20 concrete and Fe-415 steel. 14M

#### **UNIT-V**

9. Design a rectangular isolated footing of a column of size 400x600 mm carrying an axial service load of 1100KN. The safe bearing capacity of the soil at the site is  $200\text{kN/m}^2$ . Use M20 grade concrete mix and steel of grade Fe415. 14M
- (OR)**
10. Design an isolated footing for a reinforced concrete column of size 500x500 mm transfers an axial load of 900 KN and a moment of 150 kN m about the major axis. The safe bearing capacity of the soils  $200\text{kN/m}^2$  and the materials to be used are M20 grade concrete and use steel grade Fe415 14M

# AR16

**CODE: 16EE3016**

**SET-2**

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

**III B.Tech I Semester Supplementary Examinations, January-2020**

**POWER ELECTRONICS  
(Electrical and 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) What is power BJT? What are the types of power BJT's? Write the differences between general purpose BJT and power BJT. 7M  
b) Calculate the number of SCR's ,each with rating of 500V,75A required in each branch of a series and parallel combination for a circuit with a total voltage and current rating of 7.5KV and 1000A.Assume derating factor of 14%. 7M
- (OR)**
2. a) What are the different turn-on methods of a thyristor? Explain in detail of any two methods. 7M  
b) Explain in detail the voltage ratings of SCR. 7M

**UNIT-II**

3. a) A single phase half wave controlled rectifier is operated from a 120V,50Hz supply. Load resistance,  $R=10\Omega$ .If the average output voltage is 25% of the maximum possible average output voltage, Determine 7M  
(i)Firing angle (ii)RMS and average output currents  
(iii)Average and RMS SCR currents.  
b) Describe the working of single phase fully controlled bridge rectifier in the following two modes 7M  
(i)Rectifying mode (ii)Inversion mode  
Also sketch the load voltage and current waveforms for  $\alpha=45^\circ$  and  $\alpha=120^\circ$ .
- (OR)**
4. a) Derive the expression for average output voltage and input power factor of single phase fully controlled bridge rectifier with R load. 7M  
b) Explain the effect of freewheeling diode in detail. Also justify the statement "freewheeling diode improves the power factor of the system". 7M

### UNIT-III

5. a) For a three phase thyristor controlled half wave rectifier with resistive load, show that the average output voltage is given by 7M

$$V_{DC} = \frac{3\sqrt{3}}{2\pi} V_m \cos \alpha, \quad \text{for } 0 < \alpha < \frac{\pi}{6} \quad \text{and}$$

$$V_{DC} = \frac{3}{2\pi} V_m \left[ 1 + \cos \left( \alpha + \frac{\pi}{6} \right) \right], \quad \text{for } \frac{\pi}{6} < \alpha < \frac{5\pi}{6}$$

- b) A three phase full bridge converter is fed from a delta-star transformer and it is connected to a RL load with ripple current 15A at firing angle  $45^\circ$ . It is fed from 440V, 50Hz AC supply, determine rectification efficiency, transformer utilization factor and input power factor. 7M

(OR)

6. a) Draw the circuit diagram of three phase half wave controlled rectifier with RL load and explain its operating principle with voltage and current waveforms. 7M
- b) A single phase dual converter operates in the circulating current mode when per phase rms voltage is 220V, 50Hz and  $L=20\text{mH}$  with firing angle  $\alpha=45^\circ$ . 7M
- (i) Find the expression for average output voltage as function of  $\alpha$ .
- (ii) Find the average output voltage for constant load current ( $I_{dc}$ ) = 3Amp

### UNIT-IV

7. a) Draw the circuit diagram of single phase full wave ac voltage controller with RL load and explain its working principle with waveforms. 7M
- b) A single phase full wave ac voltage controller is connected with a load of  $R=5\Omega$  with an input voltage of 230V, 50Hz. When the firing angle of thyristor is  $60^\circ$ , determine the rms output voltage, power output at load and input power factor. 7M

(OR)

8. a) What is cyclo converter? What are the types of cyclo converters? List-out any two applications of cyclo converters. 7M
- b) Describe the basic principle of working of a single phase to single phase bridge type cyclo converter for discontinuous conduction with the relation  $f_o = \frac{1}{3} f_s$  7M
- Mark the conduction of various thyristors also

### UNIT-V

9. a) Explain the principle of operation buck converter with the help of waveforms. 7M
- b) Draw the circuit diagram of a single-phase full bridge voltage source inverter and explain its operating principle with R load. 7M
- (OR)
10. a) A step down DC chopper has a resistive load of  $R=15\Omega$  and input voltage  $V_{dc}=200\text{V}$ . When the chopper remains ON, its voltage drop is 2.5V. The chopper frequency is 1KHz. If the duty cycle is 50%, determine, 7M
- (i) Average output voltage (ii) RMS output voltage
- (ii) Chopper efficiency
- b) Discuss the operating principle of a three-phase bridge inverter with a suitable diagram when each semiconductor switch conducts for  $180^\circ$ . 7M

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

Answer ONE Question from each Unit

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**UNIT-I**

1. a) Explain how CMOS can be used as an inverter and give its transfer characteristic curve. 7M
- b) Show the CMOS circuit diagram for two input NOR gate and explain its operation with function table. 7M

**(OR)**

2. a) Explain the basic circuit operation of ECL OR/NOR with neat diagram and truth table. 7M
- b) With neat sketches, explain about TTL with CMOS interfacing. 7M

**UNIT-II**

3. a) Design 16X1 multiplexer using IC 74X151. 7M
- b) Write dataflow VHDL modelling for Priority encoder. 7M

**(OR)**

4. a) Design 16- bit comparator using IC 74x85. 7M
- b) Write dataflow modelling for 1x8 demultiplexer. 7M

**UNIT-III**

5. a) Design 24-bit binary adder using 74x283 ICs. 7M
- b) Write structural VHDL program for 4-bit Ripple adder/subtractor. 7M

**(OR)**

6. a) Explain the functionality of combinational multipliers with logic diagram. 7M
- b) What is meant by ALU and give HDL modelling for 4-bit ALU 7M

**UNIT-IV**

7. a) Convert JK flip-flop to SR and D flip-flops and give its necessary diagrams. 7M
- b) Design MOD-9 synchronous counter using JK flip-flops. 7M

**(OR)**

8. Design 4-bit Excess-3 UP/DOWN\_L counter using D flip-flops and write behavioural VHDL modelling for the same. 14 M

**UNIT-V**

9. a) Draw the basic structure of FPGA and explain each block of it with suitable diagrams. 7M
- b) Explain the basic structure of PROM with example. 7M

**(OR)**

10. Implement the given functions  $A(X,Y,Z)=\sum m(2,4,6,7)$ ;  $B(X,Y,Z)=\sum m(1,3,6,7)$  using PLA and PAL. 14M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

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**UNIT-I**

1. Explain in detail about software process model with a neat diagram (14M)  
(OR)
2. a) What is CMMI in software engineering? (7M)  
b) What are software myths? (7M)

**UNIT-II**

3. a) Write a short note on user requirements. (7M)  
b) Write a short note on system requirements. (7M)  
(OR)
4. a) Discuss about context model. (7M)  
b) What are behavioural models? (7M)

**UNIT-III**

5. a) Briefly explain software design process. (7M)  
b) Discuss design quality. (7M)  
(OR)
6. a) Explain any one software architectural styles. (7M)  
b) Illustrate interface design steps. (7M)

**UNIT-IV**

7. Explain in detail various testing strategies. (14M)  
(OR)
8. a) Discuss metrics for testing. (7M)  
b) What are metrics for maintenance? (7M)

**UNIT-V**

9. a) What is risk projection? (7M)  
b) Discuss risk refinement. (7M)  
(OR)
10. a) What is Software Quality Assurance (SQA)? (7M)  
b) Discuss briefly about software reliability. (7M)

**Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) 74VHCTXX series belongs to which logic family
- b) Draw the circuit diagram of 2 input AND gate using Diode Logic
- c) What is the importance of cascading inputs in 74x85
- d) Which IC acts as a 2 Input, 4 Bit Multiplexer
- e) Which type of Adder is used in IC 74x381
- f) Which type of shifter has to be used for dividing the given binary data by 2
- g) What do you mean by Clock Skew
- h) Why Asynchronous Counter works slower than Synchronous Counter.
- i) Mention any one advantage of PLDs
- j) Draw the circuit diagram of 1Bit DRAM Cell

**PART-B****Answer one question from each unit****[5x12=60M]****UNIT-I**

2. a. Design a CMOS 4-input OR-AND-INVERT gate and explain its Operation with function table [7M]
- b. Explain about Power Consumption in CMOS [5M]

**(OR)**

3. a. Draw the circuit diagram of two-input ECL OR/NOR gate and explain its Operation with the help of Functional Table [6M]
- b. Analyse the resistive model of a CMOS inverter for Non Ideal Inputs [6M]

**UNIT-II**

4. a. Design a 32x1 Multiplexer using 74x151 and 74x139 [6M]
- b. Write the VHDL Code for 74x151 using Selected Signal Assignment Statement [6M]

**(OR)**

5. a. Design a De-multiplexer using 74x138 [5M]
- b. Design a 4 Bit Parity Generator and write the VHDL code for the same in Structural Modelling. [7M]

**UNIT-III**

6. a. Write the VHDL code for Floating Point Encoder in Behavioural Modelling [5M]
- b. Draw the logic diagram of 4 Bit Ripple Carry Adder and write the VHDL code for the same in Structural Modelling. [7M]

**(OR)**

7. a. Write the VHDL code to perform 2x2 Bit Multiplication using logic gates and adders [6M]
- b. Write the VHDL code for performing 8 bit circular left shift operation using case statement [6M]

**UNIT-IV**

8. a. Write the VHDL code for 74x74 in Behavioural Modelling [6M]
- b. Design a Serial In Parallel out Shift Register using 74x74 and Write the VHDL Code for the same in Structural Modelling [6M]

**(OR)**

9. a. Write the VHDL Code for 74x163 in Behavioural Modelling [6M]
- b. Design a Mod-100 Counter using 74x163 [6M]

**UNIT-V**

10. a. What are the differences between CPLD and FPGA [4M]
- b. Design an 8x8 diode PROM using 74x138 for the following data Starting from the First Location 11,24,A5,05,C2,73,DB,52 [8M]

**(OR)**

11. a. Define the timing parameters for Write Operations in a RAM with Timing Diagram [7M]
- b. Using PLA logic, implement the following Boolean Expressions [5M]  
 $F_1 = AB' + AC'$   
 $F_2 = AC + BC$