

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-3rd Semester (IT/MC)

COURSE CODE (CREDITS): 25B11CI314 (3)

MAX. MARKS: 35

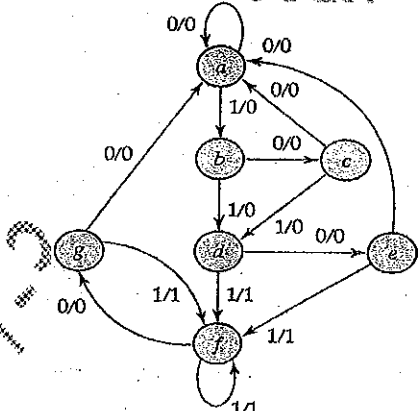
COURSE NAME: Digital Systems and Computer Organization

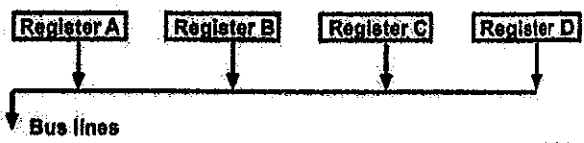
COURSE INSTRUCTORS: Dr. Vivek Kumar Sehgal

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q.No	Question	CO	Marks																																																																																									
Q1	(a) Convert the JK flip-flop and D flip-flop to T flip-flop with complete diagram.	CO-2	1.5																																																																																									
	(b) Give the Flip-Flop Characteristic Tables for: i) JK flip-flop, ii) D flip-flop, iii) T flip-flop		1.5																																																																																									
	(c) Give the Flip-Flop Excitation Tables for: i) JK flip-flop, ii) T flip-flop		2																																																																																									
Q2	Reduce the following state diagram with Reduced the State Table 	CO-2,3	5																																																																																									
Q3	Give the Logic diagram for sequential circuit with JK flip-flops excitations which maps following state table: <table><thead><tr><th colspan="2">Present State</th><th rowspan="2">Input</th><th colspan="2">Next State</th><th colspan="4">Flip-Flop Inputs</th></tr><tr><th>A</th><th>B</th><th>A</th><th>B</th><th>J_A</th><th>K_A</th><th>J_B</th><th>K_B</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td></td><td></td><td></td><td></td></tr></tbody></table>	Present State		Input	Next State		Flip-Flop Inputs				A	B	A	B	J_A	K_A	J_B	K_B	0	0	0	0	0					0	0	1	0	1					0	1	0	1	0					0	1	1	0	1					1	0	0	1	0					1	0	1	1	1					1	1	0	1	1					1	1	1	0	0					CO-3	5
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Q4	(a) Draw the common bus architecture for 4 bit four registers with four 4X1 MUXs.  $A \leftarrow B$ $AR \leftarrow DR(AD)$ $A \leftarrow \text{constant}$ $ABUS \leftarrow R1,$ $R2 \leftarrow ABUS$ AR DR $M[R]$ M $DR \leftarrow M$ $M \leftarrow DR$ (b) Explain the following Microoperations:	CO-3	5																																																																																					
Q5	Give the Arithmetic circuit for following microoperations: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>S1</th> <th>S0</th> <th>Cin</th> <th>Y</th> <th>Output</th> <th>Microoperation</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>B</td> <td>$D = A + B$</td> <td>Add</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>B</td> <td>$D = A + B + 1$</td> <td>Add with carry</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>B'</td> <td>$D = A + B'$</td> <td>Subtract with borrow</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>B'</td> <td>$D = A + B' + 1$</td> <td>Subtract</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>$D = A$</td> <td>Transfer A</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>$D = A + 1$</td> <td>Increment A</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>$D = A - 1$</td> <td>Decrement A</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>$D = A$</td> <td>Transfer A</td> </tr> </tbody> </table>	S1	S0	Cin	Y	Output	Microoperation	0	0	0	B	$D = A + B$	Add	0	0	1	B	$D = A + B + 1$	Add with carry	0	1	0	B'	$D = A + B'$	Subtract with borrow	0	1	1	B'	$D = A + B' + 1$	Subtract	1	0	0	0	$D = A$	Transfer A	1	0	1	0	$D = A + 1$	Increment A	1	1	0	1	$D = A - 1$	Decrement A	1	1	1	1	$D = A$	Transfer A	CO-3, 4	5																															
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Q6	List the microoperations and name of following 16 functions with 2 variables <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>x</th> <th>y</th> <th>Boolean Function</th> <th>Micro-Operations</th> <th>Name</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>$F0 = 0$</td><td></td><td></td></tr> <tr><td>0</td><td>0</td><td>$F1 = xy$</td><td></td><td></td></tr> <tr><td>0</td><td>0</td><td>$F2 = xy'$</td><td></td><td></td></tr> <tr><td>0</td><td>0</td><td>$F3 = x$</td><td></td><td></td></tr> <tr><td>0</td><td>1</td><td>$F4 = x'y$</td><td></td><td></td></tr> <tr><td>0</td><td>1</td><td>$F5 = y$</td><td></td><td></td></tr> <tr><td>0</td><td>1</td><td>$F6 = x \oplus y$</td><td></td><td></td></tr> <tr><td>0</td><td>1</td><td>$F7 = x + y$</td><td></td><td></td></tr> <tr><td>1</td><td>0</td><td>$F8 = (x + y)'$</td><td></td><td></td></tr> <tr><td>1</td><td>0</td><td>$F9 = (x \oplus y)'$</td><td></td><td></td></tr> <tr><td>1</td><td>0</td><td>$F10 = y'$</td><td></td><td></td></tr> <tr><td>1</td><td>0</td><td>$F11 = x + y'$</td><td></td><td></td></tr> <tr><td>1</td><td>1</td><td>$F12 = x'$</td><td></td><td></td></tr> <tr><td>1</td><td>1</td><td>$F13 = x' + y$</td><td></td><td></td></tr> <tr><td>1</td><td>1</td><td>$F14 = (xy)'$</td><td></td><td></td></tr> <tr><td>1</td><td>1</td><td>$F15 = 1$</td><td></td><td></td></tr> </tbody> </table>	x	y	Boolean Function	Micro-Operations	Name	0	0	$F0 = 0$			0	0	$F1 = xy$			0	0	$F2 = xy'$			0	0	$F3 = x$			0	1	$F4 = x'y$			0	1	$F5 = y$			0	1	$F6 = x \oplus y$			0	1	$F7 = x + y$			1	0	$F8 = (x + y)'$			1	0	$F9 = (x \oplus y)'$			1	0	$F10 = y'$			1	0	$F11 = x + y'$			1	1	$F12 = x'$			1	1	$F13 = x' + y$			1	1	$F14 = (xy)'$			1	1	$F15 = 1$			CO-4	5
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Q7	(a) Implement the major logic microoperations (AND, OR, XOR, Complement) using sequential circuits (b) Explain the three major types of shift operations with a diagram and RTL operations	CO-4	5																																																																																					