

Part B (Total: 66 marks) Write your answers within the boxes provided.

18. Sequential circuit [5]

(a) [1] (b) [4] State 0 → ; 1 → ; 2 → ; 3 →

19. Sequential circuit [10]

(a) [5] JA = ; KA = ; JB = ; KB = ; TC =

(b) [1] (c) [3] State 0 → ; 6 → ; 7 → (d) [1]

20. Combinational circuits [12]

(a) [4] $I_0I_1I_2I_3 =$
 $S_1S_0 =$

(b) [4] $X_3X_2X_1X_0 =$
 $Y_3Y_2Y_1Y_0 =$
 $C_{in} =$

(c) [4] (i) $G =$
(ii)

21. MIPS [14]

(a) [1] \$s6: (b) [1] \$s7:

(d) [2] No. of instructions:

(e) [2] beq \$t9, \$0, exit
0x

(f) [2] sub \$t7, \$s1, \$s2
0x

(g) [2] J Loop
0x

(c) [4] answer1 = answer2 = 0;
for {

}

22. Pipelining [12 marks]

(a) [1] (b) [3] (c) [3] (d) [3] (e) [2]

23. Cache [13 marks]

Data cache: Direct-mapped cache Set-associative cache

(a) [1] byte offset (b) [1] index (c) [3] #hits (d) [1] set index (e) [3] #hits

Instruction cache:

(f) [1] index (g) [3] #hits