(3 hours) **Marks: 80**

Note the following instructions.

1. **Question No.1 is compulsory**
2. **Attempt any three questions from remaining five questions**
3. **Solve in total 4 questions**
4. **Assume suitable data wherever necessary, justify the same**
5. **Figures to the right indicate full marks.**

1.a Realize the following symmetric function using full adders and gates. **[5]**
$f(v,w,x,y,z) = S_{2,4}(v,w,x,y,z)$

1.b What is a Threshold logic element? Give its advantages and limitations **[5]**

1.c What is incompletely specified machines and how to specify using compatible states? **[5]**

1.d How to determine the state table of an unknown machine? **[5]**

2.a Use the Quine–McCluskey method to generate the set of essential prime implicants and to obtain the minimal expressions for the following functions. **[10]**

$$T(w,x,y,z) = \sum (0,1,2,3,5,8,10,11,13,15)$$

2.b In the following state table, find the equivalence partition and the corresponding reduced machine in standard form. **[10]**

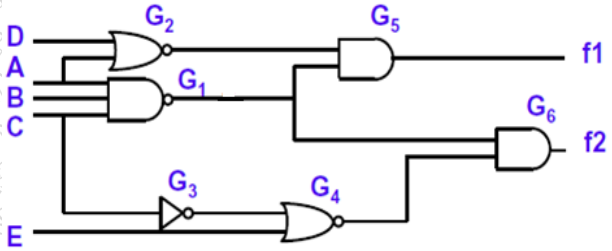
	NS, z	
PS	$x=0$	$x=1$
A	$F,0$	$B,1$
B	$G,0$	$A,1$
C	$B,0$	$C,1$
D	$C,0$	$B,1$
E	$D,0$	$A,1$
F	$E,1$	$F,1$
G	$E,1$	$G,1$

3.a (i) Give the properties of symmetric function. **[10]**
(ii) Decomposed the following function and determine the functions F and Φ.

$$f(v,w,x,y,z) = \sum (1,2,7,9,10,17,19,26,31) + \sum_{\phi} (0,15,20,23,25)$$

=F[Φ(v,w,y),x,z]

3.b Find all the test vectors that detect faults *s-a*-0 and s-a-1for all the input variable wires using the Fault table method. **[10]**

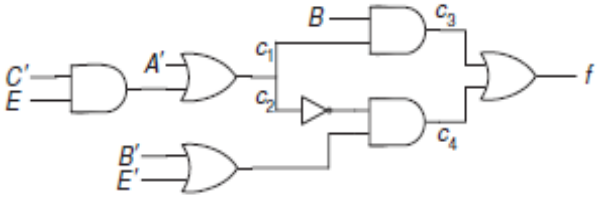


4.a Determine whether the following function is a threshold function, and if it is find a weight-threshold vector. **[10]**

$$f(v,w,x,y,z) = \sum (4,7,8,11,13,14,23,27,28,29,30)$$

4.b Explan homing and synchronizing sequence techniques **[10]**

5.a Find all the test vectors that detect input *A*'*s*-*a*-0 by using the Path sensitization and the Boolean Differences method. **[10]**



5.b Explain the lattice of closed partitions of machine**.** **[10]**

6. a Design a one-input one-output synchronous sequential circuit (Mealy Machine) which produces an output symbol *z* =1, whenever the "1101"overlap input sequence occurs.(Use only J-K Flip flops) **[10]**

6. b What are the components of ASM chart? Draw an ASM chart and state table for a 2 bit up-down counter with mode control input. **[10]**
