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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

HIGH PERFORMANCE ARCHITECTURE

(Computer Science and 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 in one place only

UNIT – I

1. (a) List and explain various hazards of compiling for scalar pipeline. [7M]
- (b) Using the simple procedure for dependence construct all the dependences for the loop nest below and provide [7M]
 - i. direction vector(s),
 - ii. distance vector(s)
 - iii. loop level for each one.

```

DO K = 1, 100
DO J = 1, 100
DO I = 1, 100
A(I+1, J+2, K+1) = A(I, J, K+1) + B
ENDDO
ENDDO
ENDDO

```
2. (a) Is the following example violates the Bernstein's conditions? Justify. [7M]

```

PARALLEL DO I= 1 , N
A(I+1) =A(I) +B(I)
ENDDO

```
- (b) List out preliminary transformations required to make dependence testing more accurate loop normalization. If there is a loop carried dependence, then that loop cannot be parallelized? Justify. [7M]

UNIT – II

3. (a) For the following example, construct valid breaking conditions. [7M]

```

DO I = 1, 100
S A(I+IX) = A(I) + C
ENDDO

```

(b) Identify and define the subscripts which are ZIV, SIV and MIV from the following example. [7M]

```
DO I
DO J
DO K
S1 A(I, J) = A(I, K) + C
ENDDO
ENDDO
ENDDO
```

4. (a) Explain about the goals of dependence testing? [7M]

(b) Define conservative testing? Explain in detail with an example. [7M]

UNIT – III

5. Explain generalized parallel code generation algorithm with loop shifting and recurrence breaking. [14M]

6. (a) For the following example draw the dependence graph and generate the scalar expansion code [7M]

```
DO I = 1, N
S1 T = A(I)
S2 A(I) = B(I)
S3 B(I) = T
ENDDO
```

(b) Explain the use of loop interchange for parallelization. What is the role of loop skewing? [7M]

UNIT – IV

7. (a) Describe how loop unroll-and-jam is used in conjunction with scalar replacement to lower the balance of a memory-bound loop. [7M]

(b) Distinguish between the write-through and write-back policies pointing out their merits and demerits? [7M]

8. How Forward and Backward branch removal will be done with If-conversion. [14M]

UNIT – V

9. (a) Identify how data dependence is calculated if registers are reused and how can we improve register reuse in loop carried and loop independent. [7M]

(b) Write a procedure to eliminate the scalar copies in iterations. [7M]

10. (a) The problem of scalar register allocation has essentially been solved by the register coloring techniques? Justify. [7M]

(b) How data dependence can affect memory hierarchy management. [7M]

