Q.1 Answer the following.

(a) What do you mean by precise exception? Explain. **02**

(b) In data parallelism method, speedup is not directly proportional to the no. of processors. State True/False and justify. **02**

(c) The average number of instructions a thread executes before it suspends is 15, the delay when a thread suspends and switches to another one is 3 cycles and the average number of cycles it waits before it gets the resource it needs is 35. What is the number of threads the processor should support to hide the latency? What is the processor efficiency? (Assume 5 stage pipelining of SMAC2P) **02**

(d) Differentiate fine grained and coarse grained jobs. **02**

(e) Register scoreboarding and renaming technique will resolve anti and output dependency. How? **02**

(f) Differentiate data parallelism with dynamic assignment and data parallelism with quasi-dynamic scheduling. **02**

Q.2 Answer any *Two*.

(a) For the given sequence of instruction develop superscalar pipeline execution diagram (Assume two floating point and two integer execution unit). **06**

Instruction	Number of cycle needed	Arithmetic unit needed
R2←R2 * R6	2	Floating point
R3←R2+R1	1	Integer
R1←R6+8	1	Integer
R8←R2 – R9	1	Integer
R5←R4/R8	2	Floating point
R6←R2+4	1	Integer
R2←R1+2	1	Integer
R10←R9*R8	2	Floating point

Reschedule instructions (If possible) to reduce the no of cycles needed to execute given set of instructions. Show the appropriate execution diagram.

(b) The following expressions are to be evaluated: **06**

$a = \sin(x^2y) + \cos(xy^2) + \exp(-xy^2)$

$b = f(u^2) + \sin(g(p)) + \cos^2(h(y^2))$

(i) Obtain a task graph for calculating a, b.

(ii) Assuming 4 processors are available. Obtain a task assignment to processors assuming the following timings for various operations:

squaring= multiplication = negation= 1

sin = cos = exponentiation = 2

g(x) = h(x) = f(x)=3

(c)
1. Explain how branch instructions delay pipeline execution. If a program has 18% conditional branch instructions and 4% unconditional branch instructions and if 7% of conditional branches are taken branches, calculate the loss in speedup of a processor with 4 pipeline stages. **04**

2. Explain the terms Pipeline stall and pipeline locking with the help of space-time diagram. **02**

Q.3

(a) An examination paper has 5 questions. The answer to these questions does not take equal time to correct. Answer to question 1 takes 4 min. to correct, question 2 takes 6 minutes, question 3 takes 5 minutes, question 4 takes 5 minutes and question 5 takes 8 minutes. Due to this speed mismatch storage should be provided between teachers. Answer the following questions assuming 2000 papers are to be corrected by 5 teachers. **06**

1. What is the idle time of teachers?
2. What is the system efficiency?
3. What will be the efficiency of system if the data parallel mode is given?

(b) What is Multithreading? Briefly explain types of multithreaded processors. **06**

OR

Q.3

(a) In the pipeline mode of processing we assumed that there is no communication delay between stages of the pipeline . If there is a delay of **y** between pipeline stages derive a speed up formula. What condition should **y** satisfy to ensure a speedup of at least **0.8k** where **k** is the no. of stages in the pipeline ? **04**

(b) Following are the sequence of instructions: **04**

I1	ADD R1,R5,R1
I2	MUL R1,R2,R3
I3	SUB R2,R6,R2
I4	DIV R5,R1,R5
I5	ADD R2,1,R1

Classify the all data dependency present between above instructions and justify.

(c) Explain hardware modification techniques using BPB, BTB in details to reduce delay due to branches. **04**

Examination	: B.TECH Semester - V	Seat No.	:
Date	: 08/10/2014	Day	: Wednesday
Time	: 11:15 to 12:30	Max. Marks	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed.
   (a) What is problem lower bound? Explain it with example. **[2]**
   (b) Give difference between DFS and BFS. **[2]**
   (c) Discuss lower bound through problem reduction with example. **[2]**
   (d) Explain the statement "P=NP if SAT $\in$ P" **[2]**
   (e) What is verifiable problem? Defined NP and P class in terms of verifiability and show that P is subset of NP. **[2]**
   (f) Explain Deterministic and Non-Deterministic algorithms with example **[2]**

**Q.2 Attempt *Any TWO* of the following questions.** **[12]**
   (a) Discuss backtracking solution for Hamiltonian Cycle Problem.
   (b) Discuss backtracking solution for Graph Coloring Problem.
   (c) Discuss backtracking solution for N-Queen Problem.

Q.3   (a) 4 job agents and 4 jobs are exists. Cost matrix for assignment of jobs is given below. **[6]**

Agents/jobs	1	2	3	4
A	11	12	18	40
B	14	15	13	22
C	11	17	19	23
D	17	14	20	28

Using Branch and Bound, assign one job to one agent such that total cost of assignment is Minimum.

   (b) Find all articulation points of following graph. Show all steps of algorithm clearly. **[6]**
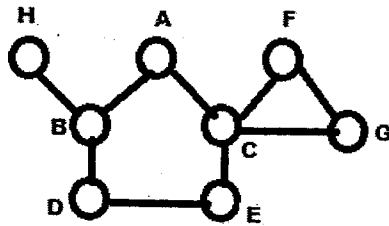
OR

Q.3   (a) Solve the following (0/1) Knapsack problem using Branch and Bound technique. **[6]**
Maximum Weight of Knapsack (W) = 16
Total Number of items = 4
Weights (W_i) and Values(V_i) for each item I is given in following table.

Items	1	2	3	4
Value(V_i)	45	30	45	10
Weight(W_i)	3	5	9	5

Put items in knapsack such that maximum profit is obtained without exceeding the maximum Weight of knapsack.

   (b) Sorting problems take $\Omega(n \log n)$ time. Prove it using decision tree model. **[6]**

Examination	: Third Sessional	Seat No.	:
Date	: 9/10/2014	Day	:Thursday
Time	: 11:15 to 12:30	Max. Marks	: 36

INSTRUCTIONS:

1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed.

A Which of the following system calls results in the sending of SYN packets?   [2]
(A) socket (B) bind (C) listen (D) connect

B In the slow start phase of the TCP congestion control algorithm, the size of the   [2]
congestion window
(A) does not increase (B) increases linearly (C) increases quadratically (D) increases exponentially

C A client process P needs to make a TCP connection to a server process S.   [2]
Consider the following situation: the server process S executes a socket (), a
bind () and a listen () system call in that order, following which it is preempted.
Subsequently, the client process P executes a socket () system call followed by
connect () system call to connect to the server process S. The server process has
not executed any accept () system call. Which one of the following events could
take place?
(A) connect () system call returns successfully (B) connect () system call blocks
(C) connect () system call returns an error   (D) connect () system call results in a core dump

D Which one of the following is not a client server application?   [2]
(A) Internet chat (B) Web browsing (C) E-mail (D) Ping

E Define Karn's algorithm.   [2]

F The maximum payload of a TCP segment is 65,495 bytes. Why such a strange number is chosen?   [2]

Q.2 Attempt *ANY TWO*.

a Write a short note on: (I) DNS (II) FTP   [6]
b Explain Three-Way Handshake Mechanism used by TCP to terminate a Session.   [6]
c Explain TCP transmission policy with silly window syndrome problem and its solutions.   [6]

Q.3(a) Let the size of congestion window of a TCP connection be 32 KB when a timeout occurs.   [6]
The round trip time of the connection is 100 msec and the maximum segment size used is
2kB. What is the time taken (in msec) by the TCP connection to get back to 32KB congestion
Window?

Q.3(b) Briefly explain the following terms : (I) Encryption (II) Authentication (III) Confidentiality [6]

-OR-

Q.3(a) (I)Consider the effect of using slow start on a line with 10 ms roundtrip time and no congestion. The receive [6]
window is 24KB and maximum segment size is 2KB. How long does it take before the first full window can
be sent?
(II)Suppose that the TCP congestion window is set to 18KB and a timeout occurs. How big will the window
be if next four transmission bursts are all successful? Assume the maximum segment size is 1KB.

Q.3(b) Explain TCP Timer management.   [6]

Examination	: B.TECH IT- Semester –V	Seat No.	:
Date	: 10/10/2014	Day	: Friday
Time	: 11:15am to 12:30pm	Max. Marks	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1   Do as directed.
   (a) How are variable area flow meters different than variable head meters?   [2]
   (b) State Bernoulli's equation for a pipe inclined at an angle.   [2]
   (c) Define Hydrostatic Pressure   [2]
   (d) State the working principle of Turbine flow meter.   [2]
   (e) What is the difference between pressure drop and pressure loss?   [2]
   (f) State any two types of tachometer that measures instantaneous speeds.   [2]

Q.2   Attempt *Any TWO* of the following questions.   [12]
   (a) Derive the equation of flow rate based on Bernoulli's principle.
   (b) State different types of restriction elements. Explain anyone in detail with its advantages and disadvantages
   (c) Explain Principle, construction & working of Magnetic type of flowmeter.

Q.3   (a) Explain any one optical based level measurement in detail.   [6]

   (b) Explain Eddy current type of tachometer in detail   [6]

OR

Q.3   (a) Enlist all types of level measurement methods available and explain any indirect method of level measurement in detail   [6]
   (b) Explain Revolution counter and Resonance type of tachometer.   [6]

Examination	: Third Sessional	Seat No.	: _____
Date	: 11/10/2014	Day	: Saturday
Time	: 11.15 to 12.30	Max. Marks	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1   Do as directed.

(a) Is Every element has unique complement in Boolean Algebra? Justify your answer   [2]

(b) Let G be a group under * and O(G) = 18, Is there any non-trivial subgroup? If yes, [2]
    What are the possible order of non-trivial subgroup

(c) If possible, give Example of numeric function a_r and b_r such that a_r does not [2]

    asymptotically dominate b_r, nor does b_r asymptotically dominate a_r

(d) Give an Example of Integral Domain which is not Field. Justify your answer.   [2]

(e) Give interpretation of $a \wedge b \neq 0$ with Hasse diagram.   [2]

(f) Write general form of particular solution of the difference equation   [2]

$$a_r - 6 a_{r-1} + 9 a_{r-2} = (r+2) 3^r$$

Q.2   Attempt *Any Three* from the following questions.   [12]

(a) Let $(A, \vee, \wedge, -)$ be a finite Boolean algebra. Let b be any non zero element in A, and
    $a_1, a_2, \ldots a_k$ be all the atoms of A such that $a_i \leq b$, then prove that

$$b = a_1 \vee a_2 \vee \ldots \vee a_k$$

(b) State and prove Langrange's theorem.

(c) If $A(z) = \dfrac{17z^3}{(1-2z)(1+3z)}$ then what is $a_r = ?$

(d) Solve:

$$a_r - 5a_{r-1} + 6a_{r-2} = r + 2^r$$

Q.3

(a) State and prove associative property for lattice.   [4]

(b) Prove that ker(f) is of ring (G, +, ·) is a ideal.   [4]

(c) Evaluate the sum: $1^2 + 2^2 + 3^2 + \ldots + r^2$ using generating function method.   [4]

OR

Q.3

(a) Let $a_r = 1$, r = 0   and $c_r = 1$, r = 0;   [4]
        = 0, r=1   =0   otherwise
        = -4, r=2
        =0   otherwise

    if $c_r = a_r * b_r$ then $b_r = ?$

(b) State and prove De'Morgan's Law for lattice.   [4]

(c) Prove that finite integral domain is a field.   [4]

Examination	:Third Sessional	Seat No.	: _____
Date	: 13/10/2014	Day	: Monday
Time	: 11:15 to 12:30	Max. Marks	: 36

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed. [12]

(a) A DBMS uses a transaction _____ to keep track of all transactions that update the database [1]
   (a) Log   (b) Table   (c) Block   (d) Statement

(b) Wait-for graph is used for [1]
   (A) Detecting view serializability.   (B) Detecting conflict serializability.
   (C) deadlock prevention   (D) deadlock detection

(c) The process of managing simultaneous operations on the database without having them [1] interfere with one another is
   (A) Serializability (B) Recoverability (C) Concurrency control(D) Transaction management

(d) Which of the following protocols ensures conflict serializability and safety from deadlocks? [1]
   (A) Two-phase locking protocol   (B) Time-stamp ordering protocol
   (C) Graph based protocol   (D) Both (a) and (b) above

(e) The drawback of shadow paging technique are [1]
   (A) Commit overhead   (B) Data fragmentation
   (C) Garbage collection   (D) All of these

(f) Which of the following does refer to the size of the data item chosen as the unit of [1] protection by a concurrency control program?
   (A) Granularity   (B) Lock   (C) Starvation   (D) Timestamp

(g) If transaction T_i gets an explicit lock on the file F_c in exclusive mode, then it has an [1] _____ on all the records belonging to that file.
   (A) Explicit lock in exclusive mode   (B) Implicit lock in shared mode
   (C) Explicit locks in shared mode.   (D) Implicit lock in exclusive mode.

(h) The schemes Wait-die and wound-wait are used for? [1]
   (A) Deadlock prevention   (B) Deadlock detection
   (C) Deadlock recovery   (D) Deadlock creation

(i) Which of the following is a stored procedure that Oracle automatically fires under [1] appropriate conditions matches?
   (A) Assertion   (B) Constraint   (C) Function   (D) Recursive function   (e) Trigger.

(j) State True or False with justification: [3]
   (i)   Every cascade less schedule is recoverable schedule.
   (ii)   Validation based protocol is optimistic concurrency control scheme.
   (iii)   Shadow paging scheme is log based recovery technique.

Q.2 Attempt *any two* from the following. [12]

(a) What are deferred modification and immediate modification technique for recovery? [6]
How recovery does take place in case of failures in these techniques?

(b) Explain Multiple Granularity protocol. [6]

(c) Consider following **Schedule-1** with several data items and transaction's timestamps 1,2,3,4 [6]
and 5 respectively. Determine whether this schedule is valid under timestamp ordering
protocol or not.

T_1	T_2	T_3	T_4	T_5
				read (X)
	read (Y)			
read (Y)				
		write (Y)		
		write (Z)		
				read (Z)
	read (Z)			
	abort			
read (X)				
			read (W)	
		write (W)		
		abort		
				write (Y)
				write (Z)

Schedule-1

Q.3 (a) Consider the following two schedules **S2** and **S3**. Which of this is conflict serializable [6]
schedule? If so, give its serial order(s) and also draw the precedence graph to prove it.
S2: R1(X); R3(X); W1(X); R2(X); W3(X).
S3:R3(X); R2(X); W3(X); R1(X); W1(X).

(b) Explain distributed database systems architecture and advantages in detail. [6]

OR

Q.3 (a) Explain the two-phase commit protocol with how it handling failures of distributed database [6]
system.

(b) Compare wait-die deadlock prevention scheme with wait-wound scheme. Explain clearly [6]
how it prevents the deadlock with example.