Code 9A05301 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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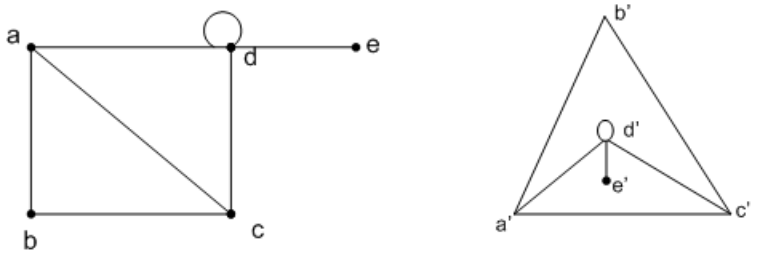
1. (a) Explain about different types of statement connectives.
   (b) Show that$\neg$P $\wedge$ ($\neg$Q $\wedge$ R)) $\vee$ (Q $\wedge$ R) $\vee$ (P $\wedge$ R) $\Leftrightarrow$ R without constructing truth table.
2. (a) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$.
   (b) Explain about free and bond variables for predicate calculus.
3. (a) Explain about the properties of a Binary relation in a set with suitable examples.
   (b) Define a lattice . Let$(L, \leq)$ be lattice in which * and $\oplus$ denote the operations of meet and join respectively. For any $a, b \in L$, show that $a \leq b \Leftrightarrow a * b = a \Leftrightarrow a \oplus b = b$.
4. (a) Define and give examples for semigroups and monaids.
   (b) Explain about the general properties of algebraic systems.
5. (a) How many 10 - digit binary numbers are there with exactly six 1's?
   (b) How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each $x_i \geq 2$?
   (c) From a group of 10 professors how many ways can a committee of 5 members be formed so that atleast one of the professor A and professor B will be included?
6. Solve the recurrence relation $a_n = c.a_{n-1} + f(n)$ for $n \geq 1$, where C is a constant, by substitution.
7. What is a spanning tree? Explain any two ways for finding out spanning tree of a given graph with examples.
8. Define isomorphism of graphs. Prove that the following graphs are isomorphic.



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Code 9A05301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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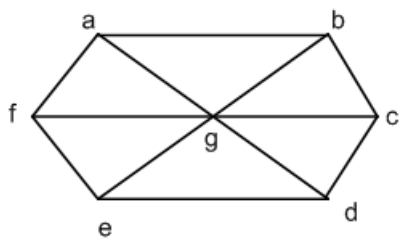
1. (a) What is a principle disjunctive normal form? Obtain the principle disjunctive form of $P \rightarrow ((P \rightarrow Q) \wedge \neg (\neg Q \vee \neg P))$
   (b) Show that $(((P \vee \neg Q) \rightarrow R \leftrightarrow S) \vee \neg (((P \vee \neg Q) \rightarrow R) \leftrightarrow S)$ is a tautology.
2. (a) Explain the concept of tree and bound variables for predicate calculus.
   (b) Show that$(x)\,(P(x) \rightarrow Q(x))) \wedge (x)\,(Q(x) \rightarrow R(x)) \Rightarrow (x)\,(P(x) \rightarrow R(x))$.
3. (a) What is an equivalence relation? Give an example. And prove that it is equivalence relation.
   (b) Define a partial order relation. Let A be a given finite set and P(A) its power set. Let $\subseteq$ be the inclusion relation on the elements of P(A). Draw Hasse diagrams of $\langle P(A), \subseteq \rangle$ for
   (i) A = {a, b}
   (ii) A = {a, b, c, d}
4. (a) Write about general properties of an algebraic system.
   (b) Explain about homomorphism of subgroups.
5. (a) How many ways can we get a sum of 4 or of 8 when two distinguishable dice are rolled? How many ways can we get an even sum?
   (b) State and prove the binomial theorem.
6. Solve $a_n - 6a_{n-1} + 12a_{n-2} - 8a_{n-3} = 0$ by generating functions.
7. (a) Explain about different representations for graphs.
   (b) Explain about DFS and BFS methods.
8. (a) Explain about multigraphs and Euler circuits with examples.
   (b) What is a chromatic number? Find the Chromatic number for the following graph.



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Code 9A05301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain different types of connectives for the statements with their truth tables.
   (b) Show that $P \rightarrow (Q \rightarrow P) \Leftrightarrow \neg P \rightarrow (P \rightarrow Q)$.
2. (a) Explain the concept of free and bound variables and rules of inference for predicate calculus.
   (b) Show that $(x)(P(x) \rightarrow Q(x)) \wedge (x)(Q(x) \rightarrow R(x)) \Rightarrow (x)(P(x) \rightarrow R(x))$.
3. (a) What is a partial order relation? Let X = {2, 3, 6, 12, 24, 36} and the relation $\leq$ be such that $x \leq y$ if x divides y. Draw the Hasse diagram of $\langle x, \leq \rangle$.
   (b) What is an equivalence relation? Give an example for equivalence relation and prove that it is an equivalence relation.
4. (a) Define a semigroup and monoid. Let S be a non empty set and P(s) be its power set. Prove that the algebras $\langle P(s), \cup \rangle$ and $\langle P(s), \cap \rangle$ are monoids.
   (b) Explain the concepts of homomorphism and isomorphism of groups with examples.
5. (a) What is pigeon hole principle? Explain any two of its applications.
   (b) How many two digits or three digits numbers can be formed by using the digits 1, 3, 4, 5, 6, 8 and 9 if no repetitions are allowed?
   (c) How many numbers can be formed using the digits 1, 3, 4, 5, 6, 8 and 9 if no repetitions are allowed?
6. Solve the recurrence relation $a_n = c.a_{n-1} + f(n)$, where C is a constant, by substitution method. Find a solution for Towers of Hanoi problem using recurrence relation.
7. Explain any two methods for finding out the spanning tree of a given graph with suitable examples.
8. Explain about multigraphs and Euler circuits.

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Code 9A05301 **4**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain different types of connectives used for making compound statements with truth tables.
   (b) Show that $P \rightarrow (Q \rightarrow P) \Leftrightarrow \neg P \rightarrow (P \rightarrow Q)$.
2. (a) With suitable examples, explain the concepts of free and bound variables for the predicate calculus.
   (b) What is automatic theorem proving? Explain with an example.
3. (a) When do you call an algebraic system is a group? Given an algebraic system which is a group and prove that it is a group.
   (b) Explain about isomorphism and homomorphism of subgroups.
4. (a) What is a poset? Explain with an example? Draw its Hasse diagram.
   (b) What is an equivalence relation? Give an example and prove that it is equivalence relation.
5. (a) How many different licence plates are there that involve 1, 2, or 3 letters followed by 4 digits?
   (b) In how many ways can 7 women and 3 men be arranged in a row if the three men must always stand next to each other?
   (c) How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each $x_i \geq 2$?
6. Solve $a_n - 6a_{n-1} = 0$ for $n \geq 1$ and $a_0 = 1$ using generating functions.
7. (a) Explain about different representations of graphs.
   (b) What is a spanning tree? Explain any one method for finding spanning tree of a given graph
8. Write a short notes on
   (a) Multigraphs.
   (b) Hamiltonian graphs.
   (c) Chromatic numbers.

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Code 9A05302 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
ADVANCED DATA STRUCTURES
(Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) What are inline functions? What are its disadvantages?
   (b) Explain the properties of object oriented languages.
   (c) Give brief description about new and delete operators.
2. (a) How can we achieve runtime polymorphism? Explain it with an example.
   (b) Explain function overloading in detail.
3. (a) How to convert an infix expression to postfix form? Explain it with an example.
   (b) Explain the working of a normal queue with its primitive operations and show the underflow and overflow conditions using an example.
4. (a) Define hash table, home bucket and bucket.
   (b) What is collision? What are the popular techniques to resolve collision? Explain them.
5. (a) Explain 2- way merge sort with example.
   (b) Discuss in detail about the insertion operation in min heaps.
6. Discuss in detail about AVL Trees.
7. (a) Write a short notes on representation of B- Trees.
   (b) Explain delete operation on B- Trees with suitable example.
8. (a) Explain KMP method of pattern matching with example.
   (b) Explain compressed tries with suitable example.

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Code 9A05302 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
ADVANCED DATA STRUCTURES
(Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Discuss in detail about the different parameter passing methods with suitable examples..
   (b) What is exception? Explain the exception handling mechanism in C++.
2. (a) What is meant by inheritance? Explain multilevel and multiple inheritance.
   (b) What is generic programming? Explain function templates with example program.
3. (a) Write a template program to implement stack using arrays.
   (b) Write a short notes on de queues.
   (c) Write the applications of stacks.
4. (a) What is rehashing? How does it overcome the drawbacks of linear probing?
   (b) Define dictionary. Explain the linear representation of dictionaries.
5. (a) Define max heap and explain how to delete an element from max heap.
   (b) Explain K- way merge sort with example.
6. (a) Define AVL Trees. Explain LR and RR rotations with suitable examples.
   (b) Write an algorithm for performing deletion in AVL trees.
7. (a) Define Red - Black trees. Write the procedure to insert an element in to Red - Black trees.
   (b) Write a short notes on height of B-trees.
8. (a) Explain suffix tries with example.
   (b) Explain Boyer- Moore algorithm with example.

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Code 9A05302 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
ADVANCED DATA STRUCTURES
(Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) What are destructors? Explain the role of constructors in programming languages.
   (b) Distinguish between normal variables and static variables.
   (c) Explain friend functions in detail.
2. (a) Define operator overloading. List the rules to overload the operators. Explain overloading of unary operator.
   (b) Differentiate between early binding the late binding.
3. (a) Write a short notes on asymptotic notations.
   (b) Explain the following operations on a single linked list
      i. Insertion
      ii. deletion
4. (a) What is dictionary? Explain the linear representation of dictionary with example.
   (b) What is collision? Explain separate chaining and extensible hashing methods to resolve collision.
5. (a) Write a short notes on poly phase sorting with example.
   (b) Give brief description about the max heaps.
6. (a) List the disadvantages of binary search trees.
   (b) Explain the deletion operation in Binary search trees.
7. (a) Explain in detail about Red - Black Trees.
   (b) Give the algorithms for insertion and deletion operations on splay trees.
8. (a) Explain standard tries.
   (b) Explain KMP method of pattern matching with example.

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Code 9A05302 4

II B.Tech I semester (R09) Regular Examinations, November 2010
ADVANCED DATA STRUCTURES
(Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define constructors. What are the properties of the constructors? Explain copy constructor in detail.
   (b) Discuss in detail about the different parameter passing methods with suitable examples.
2. (a) Define polymorphism and explain in detail about virtual functions.
   (b) Differentiate between virtual functions and pure virtual functions.
   (c) Discuss in detail about the abstract classes.
3. (a) What are the drawbacks of normal queues? Explain circular queues with example.
   (b) Write a template program to implement queue using arrays.
4. (a) Explain the skip list representation of dictionaries with example.
   (b) Discuss briefly about the various hashing techniques.
5. (a) Give brief description about the priority queues.
   (b) Write a short notes on external sorting.
6. Explain in detail about the binary search trees.
7. (a) Write a short notes on representation of B- Trees.
   (b) Explain delete operation in B- Trees with suitable example.
8. (a) What is pattern matching? Explain brute force method to match the pattern with an example.
   (b) Explain compressed tries with suitable example.

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Code 9ABS304 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY & STATISTICS
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each draw. Find the probability that
   i. Both are white
   ii. First is red and second is white.
   (b) In a factory, machine A produces 40% of the output and machine B produces 60%? On the average, 9 items in 1000 produced by A are defective and 1 item in 250 produced by B is defective. An item drawn at random from a day's output is defective. What is the probability that it was produced by A or B?

2. (a) Let x denote the minimum of the two numbers that appear when a pair of fair dice is thrown once. Determine the
   i. Discrete probability distribution
   ii. Expectation
   iii. Variance.
   (b) If x is a continuous random variable and $y = ax + b$ prove that $E(y) = aE(x) + b$ and $V(y) = a^2.V(x)$, where V stands for variance and a, b are constants.

3. (a) Out of 800 families with 5 children each, how many would you expect to have
   i. 3 boys
   ii. 5 girls
   iii. Either 2 or 3 boys
   iv. Atleast one boy. Assume equal probability for boys and girls.
   (b) The mean and standard deviation of the marks obtained by 1000 Students in an examination are respectively 34.5 and 16.5 . Assuming the normality of the distribution find the approximates number of students expected to obtain marks between 30 and 60.

4. (a) The mean height of students in a college is 155cms and standard deviation is 15. What is the probability that the mean height of 36 students is less than 157 cms.
   (b) The guaranteed average life of a certain type of electric bulbs is 1500hrs. with a S.D. of 120hrs. It is decided to sample the output so as to ensure that 95% of bulbs do not fall short of the generated average by more than 2 %? What will be the minimum sample size.

5. (a) Assuming that $\sigma = 20.0$ how large a random sample be taken to assert with probability 0.95 that the sample mean will not differ from the true mean by more than 3.0 points?
   (b) Explain the ways in which an estimation can be done. Also explain the Bayesians estimation.

6. (a) A die is tossed 256 times and it turns up with an even digit 150 times. Is the die biased?

   (b) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 inches.

7. (a) Two horses A and B were tested according to the time (in sec) to run a particular track with the following results :

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	—

   Test wether the two horses have the same running capacity.

   (b) A firm manufacturing rivets wants to limit variations in their length as much as possible. The lengths (in cms) of 10 rivets manufactured by a new process are

2.15	1.99	2.05	2.12	2.17
2.01	1.98	2.03	2.25	1.93

   Examine whether the new process can be considered superior to the old if the old population has standard deviation 0.145cm.

8. (a) A toll gate is operated on a frequency where cars arrive according to a Poission distribution with mean frequency of 1.2 cars per min. The time of completing payment follow an exponential distribution with mean of 20 sec. Find

   i. The idle time of the counter.
   ii. Average number of cars in the system
   iii. Average number of cars in the queue.
   iv. Average time that a car spends in the system.
   v. Average time that car spends in the queue.
   vi. The probability that a car spends more than 30 seconds in the system.

   (b) Consider a single server queueing system with poisson input and exponential service time. Suppose the mean arrival rate is 3 calling units per hour with the expected service time as 0.25 hours and the maximum permissible number of calling units in the system is two. Obtain the steady state probability distribution of the number of calling units in the system and then calculate the expected number in the system.

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Code 9ABS304 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY & STATISTICS
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same colour.
   (b) Suppose 5 men out of 100 and 25 women out of 10,000 are color blind. A color blind person is choosen at random. What is the probability of the person being a male (Assume male and female to be in equal numbers)?

2. (a) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.
   (b) The probability density f(x) of a continuous random variable is given by $f(x) = ce^{-|x|}, -\infty < x < \infty$. Show that C= 1/2 and find the mean and variance of the distribution . Also find the probability that the variate lies between 0 and 4.

3. (a) If x is a poisson variate such that $3p(x = 4) = 1/2p(x = 2) + p(x = 0)$, find
      i. the mean of x
      ii. $p(x \leq 2)$
   (b) The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11% Determine
      i. How many students got marks above 90%?
      ii. What was the highest mark obtained by the lowest 10% of the students?
      iii. Within what limits did the middle of 90% of the students lie?

4. (a) A random sample of size 100 is taken from an infinite population having the mean m = 76 and variance S^2 = 256. What is the probability that $\overline{x}$ will be between 75 and 78.
   (b) The mean voltage of a battery is 15 and S.D is 0.2 .Find the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts.

5. (a) The mean of random sample is an unbiased estimate of the mean of the population 3,6,9,15,27.
      i. List all possible samples of size 3 that can be taken without replacement from the finite population.
      ii. Calculate the mean of each of the samples listed in (i) and assigning each sample a probability of 1/10. Verify that the mean of these $\overline{x}$ is equal to 12 which is equal to the mean of the population θ .
   (b) A sample of size 10 was taken from a population S.D of sample is 0.3. Find the maximum error with 99% confidence.

6. (a) In a big city 325men out of 600men were found the be smokers. Does this information support the conclusion that the majority of men in this city are smokers?
   (b) A sample of 64 students have a mean weight of 70kgs. Can this be regarded as a sample from a population with mean weight 56 kgs and standard deviation 25 kgs.

7. (a) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard?
   (b) A pair of dice are thrown 360 times and the frequency of each sum is in detailed below

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

   would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance?

8. (a) Barber A takes 15 min to complete one hair cut. Customers arrive in his shop at an average rate of one every 30 min. Barber B takes 25 min to complete one hair cut and customers arrive at his shop at an average rate of one every 50 min. The arrival processes are poisson and the service times follow an exponential distribution.
      i. Where would you expect a bigger queue?
      ii. Where would you require more time waiting included to complete a hair cut.
   (b) A car park contains 5 cars. The arrival of cars is poisson with a mean rate of 10 per hour. The length of time each car spends in the car park has negative exponential distribution with mean of 2 hours. How many cars are in the car park on average and what is the probability of a newly arriving customer finding the car park full and having to park his car elsewhere?

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Code 9ABS304 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY & STATISTICS
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) State and prove addition theorem on probability for any three events.
   (b) A businessman goes to hotels x, y, z, 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in x,y,z hotels have faulty plumbings. What is the probability that business man's room having faulty plumbing is assigned to hotel?

2. (a) A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Find the mean of X.
   (b) A continuous random variable has the probability density function.

   $$f(x) = \begin{cases} \text{Kxe}^{-\lambda x}, \text{if} x \geq 0, \lambda > 0 \\ 0, \text{Otherwise} \end{cases}$$

   Determine the constant K, find mean and variance.

3. (a) Using recurrence formula find the probabilities when x=0,1,2,3,4 and 5; if the mean of the poisson distribution is 3.
   (b) If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs, How many student have masses
      i. Greater than 72 kg.
      ii. Less than or equal to 64 kg.
      iii. Between 65 and 71 kg inclusive.

4. (a) Find the value of finite population correction factor for n=10 and N=100.
   (b) The mean of certain normal population is equal to the standard error of the mean of the samples of 64 from that distribution. Find the probability that the mean of the sample size 36 will be negative.
   (c) A random sample of size 25 from a normal population has the mean $\overline{x} = 47.5$ and the standard deviation S=8.4. Does this information tend to support or refuse the claim that the mean of the population is $\mu = 42.5$?

5. (a) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with atleast 95 % confidence?
   (b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs . 487 with a standard deviation of Rs 48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 and 502?

6. (a) In a sample of 1000 people in Karnataka 540 are rice eaters, and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1 % level of significance?
   (b) In two large populations, there are 30% and 25% respectively of fair haired people . Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?

7. (a) To examine the hypothesis that the husbands are more intelligent than the wives, an investigator took a sample of 10 couples and administered them a list which measures the I.Q. The results are as follows.

Husbands	117	105	97	105	123	109	86	78	103	107
wives	106	98	87	104	116	95	90	69	108	85

   is the hypothesis correct?
   (b) Find the maximum difference that we can expect with probability 0.95 between the means of samples of sizes 10 and 12 from a normal population if their standard deviations are found to be 2 and 3 respectively.

8. (a) A T.V repair man finds that the time spent on his jobs has an exponential distribution with mean 30min. He repairs sets in the order in which they arrive. The arrival of the sets is approximately poisson with an average of 10 per an eight hour day. Find the repairman's idle time each day. How many jobs are ahead of the average set just brought in?
   (b) A self service canteen employs one cashier at its counter, 8 customers arrive per every 10 min. on an average. The cashier can serve on average one per min. Assuming that the arrivals are poisson and service time distribution is exponential determine :
      i. The average number of customers in the system;
      ii. The average queue length;
      iii. Average time a customer spends in the system
      iv. average waiting time of each customer.

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Code 9ABS304 **4**

II B.Tech I semester (R09) Regular Examinations, November 2010
PROBABILITY & STATISTICS
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Three students A, B, C are in a running race. A and B have the same probability of winning and each is twice as likely to win as C. Find the probability that B or C wins.
   (b) State and prove Baye's theorem.

2. (a) Two dice are thrown. Let X assign to each point (a,b) in S the maximum of its numbers i.e, $x(a,b) = \max(a,b)$ Find the probability distribution. X is a random variable with $x(s) = \{1,2,3,4,5,6\}$. Also find the mean and variance of the distribution.
   (b) Probability density function of a random variable x is $f(x) = \begin{cases} \frac{1}{2}\sin x, for 0 \le X \le \pi \\ 0, elsewhere \end{cases}$
   Find the mean, mode and median of the distribution and also find the probability between 0 and $p/2$.

3. (a) 20% of items produced from a factory are defective. Find the probability that in a sample 5 chosen at random
      i. none is defective
      ii. one is defective
      iii. $p(1 < x < 4)$
   (b) Find the mean and standard deviation of a normal distribution in which 7% of items are under 35 and 89% are under 63.

4. (a) When a sample is taken from an infinite population, what happens to the standard error of the mean if the sample size is decreased from 800 to 200.
   (b) A manufacturer claims that any of his list of items can not have variance more than $1cm^2$ .A sample of 25 items has a variance of $1.2cm^2$. Test whether the claim of the manufacturer is correct.

5. (a) Find 95% confidence limits for the mean of a normally distributed population from which the following samples was taken 15,17,10,18,16,9,7,11,13,14.
   (b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs 487 with a standard deviation of Rs 48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502 ?

6. (a) Explain the types of the errors in sampling.
   (b) A die is tossed 960 times and it falls with 5 upwards 184 times. Is the die unbiased at a level of significance of 0.01?

7. (a) A sample of 26 bulbs gives a mean life of 990 hours with a S.D. of 20 hours. The manufactures claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard?
   (b) The heights of 10 males of a given locality are found to be 70,67,62,68,61,68,70,64,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom. ($t = 1.833 \ \ at \ \ \alpha = 0.05$) .

8. Arrival rate of telephone calls at a telephone booth are according Poisson distribution with an average time of 12 min. between two consecutive call arrivals . The length of telephone calls is assumed to be exponentially distributed with mean 4-minutes.
   (a) Find the probability that a caller arriving at the booth will have to wait.
   (b) Find the average queue length that forms from time to time.
   (c) Find the fraction of a day that the phone will be in use.
   (d) What is the probability that an arrival will have to wait for more than 15 min. before the phone is free?
   (e) The telephone company will install a second booth. When convinced that an arrival would expect to have a wait at least 5 min. for making the call. Find the increase in flows of arrivals which will justify a second booth.

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Code :9A02306 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
BASIC ELECTRICAL ENGINEERING
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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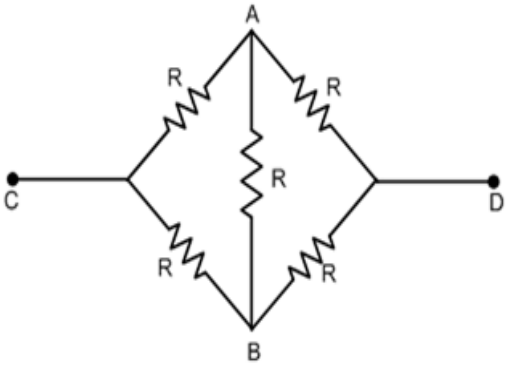
1. (a) Define and explain resistance, inductance, and capacitance.
   (b) Two resistances of 1.5Ω and 3.5Ω are connected in parallel and this parallel combination is connected in series with a resistance of 1.95Ω . Find the equivalent resistance of the circuit. What current will it draw if connected to a 30V supply.

2. (a) State and explain superposition theorem.
   (b)



   Find the equivalent resistance between C and D.

3. Show that peak factor of a sinusoidal current wave form is 1.414.

4. (a) Explain the constructional details of single phase transformer.
   (b) A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 600W. Determine the efficiency at 80% of full load.

5. (a) Derive the emf equation of DC generator.
   (b) A 4 - pole DC shunt generator with lap - connected armature supplies a load of 100A at 200V. The armature resistance is 0.1Ω and the shunt field resistance is 80Ω . Find the total armature current and emf generated.

6. (a) Explain the principle of operation of DC Motor.
   (b) A 100V series motor takes 45A when running at 750 rpm. Its armature resistance is 0.22Ω , while the series field resistance is 0.13Ω . Iron and friction losses amount to 750W. Find the shaft power.

7. Explain the principle of operation of 3 - phase induction motor in detail.

8. Explain permanent magnetic moving coil instruments in detail with a neat diagram.

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Code :9A02306

2

II B.Tech I semester (R09) Regular Examinations, November 2010
BASIC ELECTRICAL ENGINEERING
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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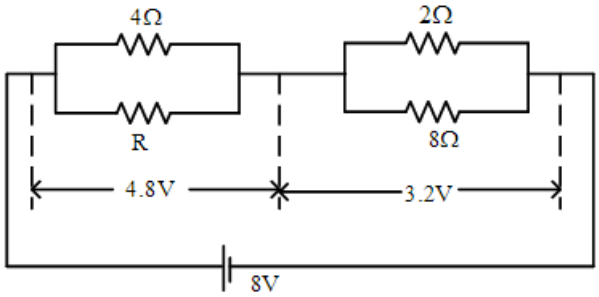
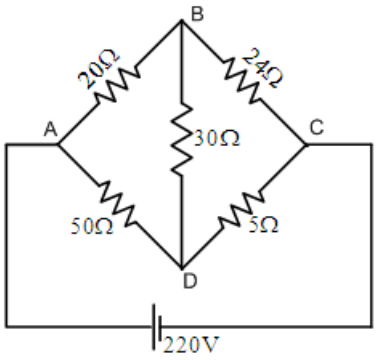
1. (a) Define and explain basic circuit components.
   (b)



   If the total power disipated in a network shown is 16W, find the value of R and the total current.

2. (a) State and explain Thevenin's theorem.
   (b)



   Determine the current delivered by the source.

3. (a) Show that power dissipated by a pure inductive circuit excited by a sinusoidal source is zero.
   (b) A pure capacitance $C = 10\mu F$ passes a current i = 10sin 2000t amperes. Find the voltage across the element.

4. Explain the tests to be conducted to determine copper and iron losses with neat circuit diagram.

5. (a) Explain the principle of operation of DC generator.
   (b) A six pole, lap-wound armature has 840 conductors and flux per pole of 0.018Wb. Calculate the emf generated, when the machine is running at 600 rpm.

6. (a) What is the significance of Swinburnis Test? Explain with a neat diagram.
   (b) A 220V DC shunt motor takes a total current of 100A and runs at 750 rpm. The resistance of armature winding and of shunt field winding is 0.1Ω and 40Ω respectively. Find the torque developed by armature.

7. (a) Explain with the help of suitable diagram, how a rotating magnetic field is produced in a 3 - phase induction motor.
   (b) A 12 - pole 3 - phase induction motor runs at 485 rpm on a 50 Hz supply. Calculate slip.

8. Explain the principle and the operation of moving iron attraction type instruments with neat diagram.

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Code :9A02306 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
BASIC ELECTRICAL ENGINEERING
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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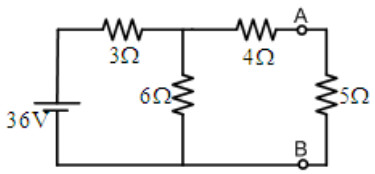
1. (a) Define and explain Kirchhoff's law.
   (b) Three resistors of $5\Omega, 10\Omega, 15\Omega$ are joined in parallel. If the current in 10Ω resistor is 3A, what is the current in other resistors and the total current?

2. (a) Explain the passive elements in detail.
   (b) By using Thevenins theorem find the current through 5Ω resistor.



3. Show that form factor of a sinusoidal current is 1.11.

4. (a) Explain the principle of operation of a single phase transformer.
   (b) A 3300/220V, 30KVA, single phase transformer takes a no load current of 1.5A when the low voltage winding is open. The Iron loss component is 0.4A. Find
      i. No load input power.
      ii. Magnetising component.
      iii. Power factor of no load current.

5. Explain the types of DC Generator in detail.

6. (a) Explain the losses that occur in a DC Machine.
   (b) A 500V DC shunt motor takes 4A on no load. The armature resistance including that of brushes is 0.2Ω and the field current is 1.0A. Estimate the output and efficiency when the input current is 20A.

7. (a) Define and explain slip of 3-phase induction motor.
   (b) Calculate the synchronous speed, slip and rotor frequency of a 3-phase 50Hz, 4-pole induction motor running at 1440 rpm.

8. (a) Make a comparison between spring control and gravity control.
   (b) A moving - coil instrument gives a full scale deflection, when the current is 35mA and its resistance is 20Ω. Calculate the value of the shunt to be connected in parallel with the meter to enable it to be used as an ammeter for measuring currents upto 45A.

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Code :9A02306

4

II B.Tech I semester (R09) Regular Examinations, November 2010
BASIC ELECTRICAL ENGINEERING
(Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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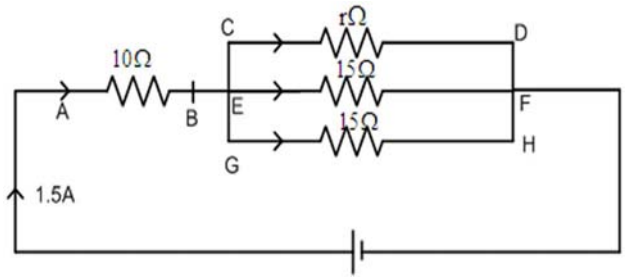
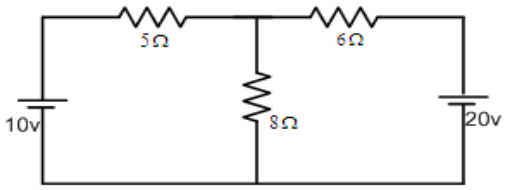
1. (a) Define and explain Ohm's Law.



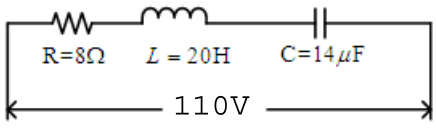
(b) For the circuit shown, calculate the value of resistance r, when the total current taken by the network is 1.5 A.

2. (a) Explain the types of sources in detail .



(b) By using the superposition theorem find the current through 8 Ω resistor.

3. (a) Derive the expression for R.M.S value of a sinusoidal current wave form.
(b) Calculate the current, power and power factor of the given circuit.



4. Define efficiency and regulation of transformer. Explain the tests to be conducted to predetermine the efficiency and regulation with neat diagrams.

5. (a) What is the significance of open circuit characteristics? How these characteristics are determined experimentally.
(b) A 4-pole DC generator has 378 wave wound conductors in its armature. If the fluxes per pole is 0.02 wb and the generator runs at 1000 rpm. Calculate the induced emf.

6. (a) Derive the expression for torque of a DC motor.

(b) A DC series motor having a resistance of 1Ω between terminals, runs at a speed of 800 rpm at 200v with a current of 15A. Find the speed at which it will run when connected in series with a 5Ω resistance taking the same current at the same supply voltage.

7. (a) Derive the relationship between the frequency of the rotor induced emf and the supply frequency of the stator.

   (b) A 6-pole induction motor is fed by a 3-phase 50Hz supply and running with a full load slip of 3%. Find the full load speed of the induction motor and also the frequency of the rotor emf.

8. (a) Explain the principle and operation of moving iron repulsion type instruments.

   (b) A meter movement with full-scale deflection current of 80μ A and internal resistance of 50Ω is required to measure a maximum current of 25mA. Determine the shunt resistance needed.

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Code 9A04301

1

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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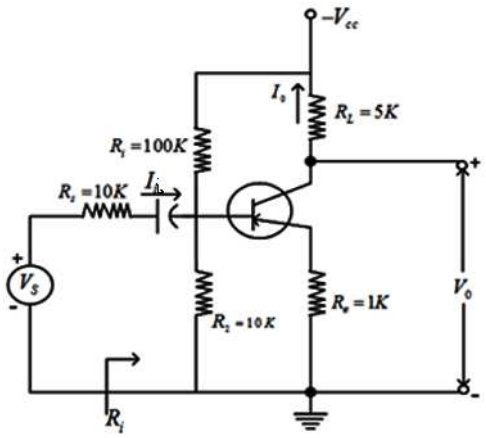
1. (a) Discuss PN diode VI characteristics with neat sketch.
   (b) Calculate the factor by which the current will increase in silicon diode operating at a forward voltage of 0.4 Volts, when the temperature is raised form 25^0C to 150^0C.
2. (a) With Circuit and necessary waveforms explain the operation of centered tapped FWR.
   (b) Derive the expression for ripple factor for the circuit FWR with inductor filter.
3. (a) With neat sketch explain the different current components of transistor.
   (b) In an NPN transistor emitter is grounded, base is connected with 4 Volts supply in series with 100 K ohms resistor and collector base is connected with 4 Volts supply in series with 2 K ohms. Assume $V_{CC} = 12Volts, V_{BE} = 0.7Volts, \beta = 100$. Find I_B, I_C *and* I_E
4. (a) What are the draw backs of transistor fixed bias circuits?
   (b) Derive an expression for stability factor S in self bias circuit.
5. (a) With neat structure explain the principle of operation of depletion MOSFET.
   (b) Explain drain characteristics of JFET.
6. (a) Derive an expression for voltage gain, Input Impedance and output impedance of CS amplifier at low frequencies.
   (b) Discuss self biasing of JFET.
7. For the transistor amplifier shown below, Compute $A_I = I_o/I_i, A_V, A_{VS}$ *and* R_i. Assume $h_{ie} = 1100\,ohms$, $h_{fe} = 50, h_{re} = 2.5 \times 10 - 4, h_{oe} = 24uA/V$



8. Discuss the principle of operation and VI characteristics of
   (a) Photo Diode
   (b) Uni Junction Transistor

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Code 9A04301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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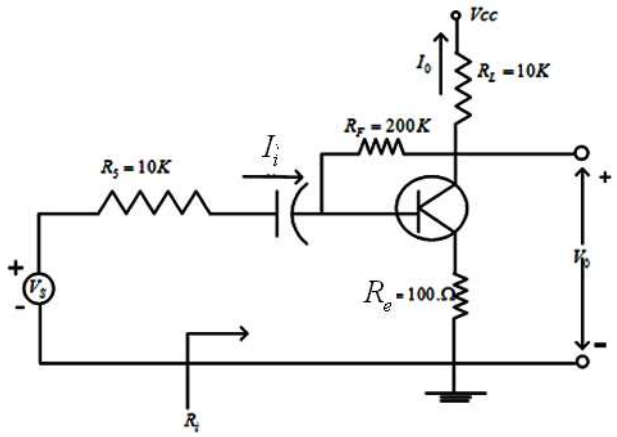
1. (a) Discuss energy band diagram for PN diode for the following cases
   i. Un biased
   ii. Forward biased
   iii. Reverse biased
   (b) Determine the forward resistance of PN diode, when the forward current is 5 MA at T=300K. Assume the diode is silicon.
2. (a) With circuit and necessary waveforms explain the operation of HWR
   (b) Derive the expression for ripple factor for the circuit HWR with capacitor filter.
3. (a) Explain how transistor will act as an amplifier.
   (b) Discuss in detail about early effect and its consequences.
   (c) Derive the relation base current and collector current.
4. (a) Explain diode compensation circuit for variations in V_{BE} for self bias circuit.
   (b) Derive an expression for stability factor S' in self bias circuit
5. (a) With neat structure explain the principle of operation of enhancement MOSFET
   (b) Discuss the relationship between FET parameters.
6. (a) Derive an expression for voltage gain, input Impedance and output impedance of CD amplifier at low frequencies.
   (b) Discuss voltage divider biasing of JFET
7. For the transistor amplifier shown below, Compute $A_I = I_0/I_i, A_V, A_{VS}$ *and* R_i. Assume $h_{ie} = 1100\,ohms,\ h_{fe} = 50,\ h_{re} = 2.5\,X\,10 - 4\ h_{oe} = 24\ uA/V$



8. Explain the principle of operation and VI characteristics of SCR. Also state few applications of SCR.

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Code 9A04301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Discuss temperature dependence of PN diode VI characteristics.
   (b) Derive an expression for dynamic resistance of PN diode.
   (c) The voltage across a silicon diode at room temperature is 0.7 Volts when 2 mA current flows through it. If the voltage increases to 0.75 Volts, Calculate the diode current.
2. (a) With circuit and necessary waveforms explain the operation of Bridge Rectifier.
   (b) Design a filter for FWR circuit with LC filter to provide an output voltage of 10 Volts with a load current of 200 mA and the ripple is limited to 2%.
3. (a) Explain input characteristics transistor CB configuration.
   (b) A transistor with $\alpha = 0.97$ has a reverse saturation current of 1 uA in CB configuration. Calculate the value of leakage current in the CE configuration. Also find the collector current and the emitter current if the value of base current is 20 uA.
4. (a) Explain diode compensation circuit for variations in I_C for self bias circuit.
   (b) How self bias circuit will eliminate drawbacks in fixed bias circuit?
5. (a) With neat structure explain the principle of operation of JFET.
   (b) Explain how depletion mode MOSFET can also act as enhancement mode MOSFET.
6. (a) Derive an expression for voltage gain, Input impedance and output impedance of CG amplifier at low frequencies.
   (b) In an N - channel JFET based voltage divider common drain configuration, determine the value of resistor R_S so as to have the operating point as IDQ = 5mA, VDSQ =10 V. Given that VDD=28V, R1 1 M ohms, R2=0.5 M ohms, saturation drain current of the FFET is 10 mA and gate source pinch off voltage is '-5V'.
7. (a) Give the comparison of CE,CC and CB amplifiers with respect to voltage gain, current gain, input impedance and output impedance.
   (b) Find expressions for voltage gain, current gain, Input impedance and output impedances of CC amplifier using simplified hybrid model?
8. Discuss the principle of operation of
   (a) Varactor Diode
   (b) LED
   (c) LDR

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Code 9A04301 4

II B.Tech I semester (R09) Regular Examinations, November 2010
ELECTRONIC DEVICES & CIRCUITS
(Electrical & Electronics Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering, Computer Science & Systems Engineering, Information Technology, Computer Science & Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Discuss zener and avalanche break down mechanisms.
   (b) Derive an expression for transition capacitance of PN diode.
2. (a) With simple circuit explain how Zener diode will act as a regulator.
   (b) In a bridge rectifier, the transformer is connected to 220 Volts, 60Hz mains and turns ratio of the step down transformer is 11:1. Assuming the diodes to be ideal, find
      i. Voltage across the load
      ii. D.C. Current
      iii. PIV
3. (a) Explain output characteristics transistor CE configuration?
   (b) The reverse leakage current of the transistor when connected in CB configuration is 0.2 uA and it is 18 uA when the same transistor is connected in CE configuration. Calculate α_{dc} and βdc .
4. (a) What is thermal runaway and what is the condition for thermal stability in CE configuration?
   (b) In an NPN transistor if $\beta = 50$ is used in common emitter circuit with VCC = 10 Volts and RC=2 K Ohms. The bias is obtained by connecting 100 K Ohms resistor from collector to base. Find the operating point.
5. (a) State advantages and disadvantages of FET's over BJT's.
   (b) Discuss the VI characteristics of depletion mode MOSFET.
6. (a) Explain how FET acts as VVR.
   (b) Discuss the concept of biasing of MOSFET's (Both Depletion and Enhancement)
7. Derive the expressions for voltage gain, current gain, Input impedance, output impedance, voltage gain with respect to source and current gain with respect to source for generalized transistor amplifier at low frequencies.
8. Explain the principle of operation and characteristics of Tunnel diode with the help of energy band diagrams.

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Code 9A04306 1

II B.Tech I semester (R09) Regular Examinations, November 2010
DIGITAL LOGIC DESIGN
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Perform the following operations by using 2's complement method.
   i. 21-42
   ii. -46-25
   (b) Convert the following to binary and then to gray code
   i. $AB33_{16}$
   ii. 1764_8

2. (a) Simplify the following expressions using Boolean algebra.
   i. $Y(A,B,D) = \left(\overline{A}+B\right)(A+B+D)\,\overline{D}$
   ii. $Y(A,B,C) = \sum M(1,3,5,7)$
   (b) Obtain the complement of following Boolean expressions
   i. $\left(AB^1+AC^1\right)\left(BC+BC^1\right)(ABC)$
   ii. $(ABC)^1(A+B+C)^1$
   (c) Obtain dual of following expression $A+B^1C\left(A+B+C^1\right)$

3. (a) Minimize the following Boolean functions :
   i. $Y(A,B,C,D) = \sum_m(1,3,5,8,9,11,15) + d(2,13)$
   ii. $Y(A,B,C,D) = \Pi_m(1,2,3,8,9,10,11,14).d(7,15)$
   (b) Draw the logic diagram using only two input NAND gates to implement the following expression. $F = \left(AB+\overline{AB}\right)\left(C\overline{D}+\overline{C}D\right)$

4. (a) Design a combinational circuit that accepts a 3-bit BCD number and generates an output binary number equal to the square of the input number.
   (b) Implement the following logic function using an 8×1 Mux: $F(A,B,C,D) = \sum_m(1,3,4,11,12,13,14,15)$

5. (a) What is race-around condition? How does it get eliminated in a Master-Slave J-K flip-flap? Explain?
   (b) Draw the schematic circuit of D-Flip Flop with negative edge triggering using NAND gates. Give its truth table and explain its operation.

6. (a) Design a 3-bit binary up/down counter. Draw its timing diagram?
   (b) write the HDL behavioural description of a 4-bit universal shift register?

7. Implement the following output functions using suitable PLA
   $F_1(A,B,C,D) = \sum_m(3,7,8,9,11,15)$
   $F_2(A,B,C,D) = \sum_m(3,4,5,7,10,14,15)$
   $F_3(A,B,C,D) = \sum_m(1,5,7,11,15)$

8. (a) Explain the fundamental and pulse mode asynchronous sequential circuits.
   (b) Find the equivalence partition and a corresponding reduced machine in standard form for the machine given below.

PS	NS, Z	
	X=0	X=1
A	E,0	C,0
B	C,0	A,0
C	B,0	G,0
D	G,0	A,0
E	F,1	B,0
F	E,0	D,0
G	D,0	G,0

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Code 9A04306 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
DIGITAL LOGIC DESIGN
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Perform the addition & subtraction of following numbers in BCD
   i. 917+215
   ii. 68-24 (use 10's complement)
   (b) What do you mean by self complementary code? What are the two self complementary codes? Explain.

2. (a) Express the Boolean function $F = A + B^1C$ as a sum of minterms.
   (b) Simplify the following expressions
   i. $Y(A, B, C, D) = \overline{(\overline{A} + C).(B + \overline{D})}$
   ii. $\mathrm{Y}(\mathrm{A}, \mathrm{B}) = \left(\overline{A + B}\right)\left(\overline{\overline{A} + \overline{B}}\right)$
   iii. $Y(A, B, C) = A\left[B + \overline{C}\left(\overline{AB + A\overline{C}}\right)\right]$

3. (a) Minimize the following function using K-map $\mathrm{Y}(\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}, \mathrm{E}) - \sum m(0, 1, 5, 6, 9, 13, 14, 17, 21, 22, 25, 29)$
   (b) Derive the Boolean expression for a two input Ex-OR gate to realize with two input NAND gates without using complemented variables & draw the circuit.

4. (a) Implement 64X1 multiplexer with four 16X1 and one 4X1 multiplexer (Use only block diagram)
   (b) A combinational logic circuit is defined by following Boolean functions.
   $F_1 = ABC + AC$ $\mathrm{F}_2 = ABC + AB$
   $F_3 = ABC + AC$
   Design the circuit with decoder and external gates.

5. (a) Define the following terms in connection with a flip-flop
   i. Set-up time
   ii. Hold-time
   iii. Propagation delay
   (b) Draw the schematic circuit of an edge triggered J.K flip flop with active low preset and active low clear using NAND gates and explain its operations with the help of truth table.

6. (a) Write the HDL structural description of the 4-bit binary counter with parallel load.
   (b) Design a 4-bit ring counter using D-flipflops and draw the circuit diagram.

7. (a) Explain the need and advantages of using programmable logic devices in digital system design?
   (b) Design a 3-bit binary to Gray code converter using a suitable PLA.

8. (a) What is meant by Hazard? Classify & explain.
   (b) Draw the logic diagram of the product of sums expression :
   $y = \left(x_1 + x_2^1\right)(x_2 + x_3)$
   Show that there is a O-harazd when x_1 and x_3 are equal to 0 andx_2 goes from 0 to 1. Find a way to remove the hazard by adding one or more OR gates.

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Code 9A04306 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
DIGITAL LOGIC DESIGN
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Perform the following subtraction of BCD numbers using 9's and 10's complement methods.
   i. 33-77
   ii. 69-36
   (b) Encode 1011 into 7-bit even parity Hamming code?
   (c) What is Gray code? Give the advantages of Gray code over binary code?

2. (a) Express the Boolean function as sum of min terms and product of max terms.
   i. $F_1 = \overline{B}D + \overline{A}D + BD$
   (b) Find the complement & dual of function given below and then reduce it to a minimum no of literals in each case $f = [(\overline{a}b)\, a]\, [(\overline{a}b)\, b]$
   (c) Prove the following :
   i. $A \oplus B = \overline{A} \oplus \overline{B}$
   ii. $\overline{A \oplus B} = \overline{A} \oplus B = A \oplus \overline{B}$

3. (a) Reduce using mapping the expression $f = \Pi M\,(2, 8, 9, 10, 11, 12, 14)$ and implement the real minimal expression in universal logic.
   (b) Write HDL description of the circuit specified by the following Boolean functions
   $X = A\,(CD + B) + BC^1$
   $Y = \left(AB^1 + A^1B\right) C + D^1$
   $Z = \left[(A + B)\left(C^1 + D^1B\right)\right]^1$

4. (a) Draw and explain the block diagram of an n-bit parallel adder and explain its limitations.
   (b) Implement a full subtractor using two 4:1 multiplexers.

5. (a) Give the implementation procedure for a SR hatch using NOR gates.
   (b) Explain the procedure for the design of sequential circuits with example.

6. (a) Draw a neat circuit diagram of a 3-bit Johnson counter. Draw the relevant output waveforms.
   (b) Explain with a neat diagram 3-bit hi-directional shift register using D flip-flop.

7. (a) Describe the differences between PLA and PAL. Use logic diagrams for explanation.
   (b) Derive PLA and PAL programming tables for a combinational circuit that squares a 3-bit number.

8. (a) Derive the state diagram and state table for two inputs (x_1, x_2) and single output Z asynchronous circuit. The output of the circuit $Z = x_1$ if but if x_2=0, the output is to remain fixed at its last value before x_2 becomes zero. Design the circuit using D-flip flops.
   (b) Define races in asynchronous sequential circuits.

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Code 9A04306 4

II B.Tech I semester (R09) Regular Examinations, November 2010
DIGITAL LOGIC DESIGN
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Find the excess - 3 code and its 9's complement for the decimal number 812?
   (b) Find the gray code for the following binary number 11001100.
   (c) Explain the rules of 2's complement addition & subtraction with suitable examples.

2. (a) Obtain dual of following functions
      i. $\overline{A}B+\overline{A}B\overline{C}+\overline{A}BCD+\overline{A}B\overline{C}\overline{D}\overline{E}$
      ii. $AB + \overline{AC} + A\overline{B}C$
   (b) Given $\overline{AB} + \overline{A}B = C$, find $\overline{AC} + \overline{A}C$
   (c) Simplify the following Boolean expression to minimum no of literals.
      i. $\overline{A}B\left(\overline{D} + \overline{C}D\right) + B\left(A + \overline{A}CD\right)$
      ii. $\overline{xz} + \overline{yz} + y\overline{z} + xyz$

3. (a) Implement the function F with the following four two -level forms :
      i. NAND-AND
      ii. AND-NOR
      $F(A, B, C, D) = \sum m(0, 1, 2, 3, 4, 8, 9, 12)$
   (b) Define the following
      i. Prime implicant
      ii. Non-Prime implicant
      iii. Essential prime implicants.

4. (a) Draw and explain the logic diagram to find the 2's complement of a 4-bit binary number when M=0, otherwise the output is same as the input.
   (b) Design a full adder using 3-to-8 line decoder

5. (a) Explain how a J-K flip flop is corrected in to a D-Flip Flop and T- Flip Flop.
   (b) A sequential circuit has three D Flip Flops A,B,C and one input x. It is described by the following Flip Flops input functions
   $D_A = \left(BC^1 + B^1C\right)x + \left(BC + B^1C^1\right)x^1$
   $D_B = A, D_C = B$
      i. Derive stable table for the circuit.
      ii. Draw state diagram for x=1.

6. (a) Explain synchronous and ripple contents. Compare their merits demerits.
   (b) Draw the logical diagram of a 4-bit shift register? Explain how shift-left and shift-right operations are performed.

7. A 3-input , 4-output combinational circuit has the following output functions. Implement the circuit using a suitable PAL.
   $A(x, y, z) = \sum m(1, 2, 4, 6)$
   $B(x, y, z) = \sum m(0, 1, 3, 6, 7)$
   $C(x, y, z) = \sum m(1, 2, 4, 6, 7)$
   $D(x, y, z) = \sum m(1, 2, 3, 5, 7)$

8. (a) Explain the design procedure for asynchronous sequential circuits.
   (b) Differentiate static -0 and static -1 hazards with waveform and explain the methods of eliminate static hazards in an asynchronous circuit.

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