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FIFTH SEMESTER

END SEMESTER EXAMINATION

MC-301, Modern Algebra

Time: 3 Hours

Roll No: 2K12/MC/009

B.Tech.

(Nov.-Dec., 2014)

Max. Marks: 70

Note: Attempt all the questions by selecting any two parts from each question.
All questions carry equal marks.

- (1) (a) Define subgroup with an example. Let H and K be finite subgroups of group G such that HK is also a subgroup. Then show that $\phi(HK) = \frac{\phi(H)\phi(K)}{\phi(H \cap K)}$.
 (b) Define a cyclic group with an example. Let G be finite cyclic group of order n . Then show that G has $\phi(n)$ generators.
 (c) Define the concept of Coset and state its properties. State and prove Lagrange's theorem. Is converse of Lagrange's theorem true justify.
- (2) (a) Define Simple group. show that a simple abelian group is a cyclic group of prime order.
 (b) State and prove Third fundamental theorem of group isomorphism.
 (c) Define permutation group with an example. State and prove cayley's theorem.
- (3) (a) Define a division ring with an example. Show that every field is an integral domain, is its converse true justify.
 (b) Define an ideal of a ring with an example. Show that $\ker f$ is an ideal in R whenever $f : R \rightarrow R'$ is a homomorphism of R in R' .
 (c) State and prove first fundamental theorem of Ring homomorphism.
- (4) (a) Show that any field is simple ring and also show that converse is true only for commutative rings with 1.
 (b) Define prime ideal with an example and show that an ideal P in R is a prime ideal if and only if R/P is an integral domain.
 (c) Define Maximal ideal with an example. Show that an ideal M in Z is a maximal ideal if and only if $M = pZ$ where p is a prime.
- (5) (a) Define embedding. State and prove the embedding theorem.
 (b) Define principal ideal domain with an example. Show that the ring $R = \{m/n | m, n \in \mathbb{Z}, n \text{ odd}\}$ is a principal ideal domain.
 (c) Define unique factorization domain with an example. Show that every Euclidean domain or a principal ideal domain is a unique factorization domain.

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Roll No..... MC/009

B.Tech. V SEMESTER

END SEMESTER EXAMINATION

NOVEMBER-2014

MC-302 OPERATIONS RESEARCH

Time: 3:00 Hours

Max. Marks: 70

Note- Attempt any SIX questions. Q.7 is compulsory.

Assume suitable missing data, if any.

Q.1. Solve by using Big M -Method

$$\begin{aligned} \text{Min } Z &= 4x_1 + x_2 \\ \text{s.t. } 3x_1 + x_2 &= 3 \quad -1 \\ 4x_1 + 3x_2 &\geq 6 \quad -2 \\ x_1 + 2x_2 &\leq 4 \quad -3 \\ x_1, x_2 &\geq 0 \end{aligned} \quad (11)$$

Q.2 Solve the following LPP problems by two - phase method :

$$\begin{aligned} \text{Max } Z &= 5x_1 - 2x_2 + 3x_3 \\ \text{s.t. } 2x_1 + 2x_2 - x_3 &\geq 2 \\ 3x_1 - 4x_2 &\leq 3 \\ x_1 + 3x_3 &\leq 5 \\ x_1, x_2, x_3, x_4 &\geq 0 \end{aligned} \quad (11)$$

Q.3. Use dual simplex method to solve :

$$\begin{aligned} \text{Max } Z &= -2x_1 - x_2 \\ \text{s.t. } x_1 + x_2 - x_3 &\geq 5 \\ x_1 - 2x_2 + 4x_3 &\geq 8 \\ x_1, x_2, x_3 &\geq 0 \end{aligned} \quad (11)$$

✓ Q. 4. Solve the Transportation problem in which cell entries represents unit cost.

	To			Available
From	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Required	7	9	18	

(11)

Q.5. A car hire company has one car at each of five depots a, b, c, d and e. A customer requires a car in each town, namely A,B,C,D and E. Distance (in kms) between depots (origins) and towns (destinations) are given in the following distance matrix :

	A	B	C	D	E
a	160	130	175	190	200
b	135	120	130	160	175
c	140	110	155	170	185
d	50	50	80	80	110
e	55	35	70	80	105

How should cars be assigned to customers so as to minimize the distance travelled? (11)

Q.6. Solve the LPP by Gomory constraint method :

$$2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$\text{Min } Z = 3x_1 + 5x_2$$

x_1 and x_2 are positive integers.

(11)

Q.7. The following table gives the activities for buying a new car.

(15)

	ACTIVITY	PREDECESSOR(S)	DURATION(DAYS)
A	Conduct feasibility study	-	3
B	Find potential buyer for present car	A	14
C	List possible models	A	1
D	Research all possible models	C	3
E	Conduct interview with mechanic	C	1
F	Collect dealer propaganda	C	2
G	Compile pertinent data	D,E,F	1
H	Choose top three models	G	1
I	Test-drive all three choices	H	3
J	Gather warranty and financing data	I	2
K	Choose one car	J	2
L	Choose dealer	K	2
M	Search for desired color and options	L	4
N	Test - drive chosen model once again	L	1
O	Purchase new car	B,M,N	3

(i) Construct the project network.

(ii) Determine the critical path for the project network.

(iii) Compute the floats for non - critical activities and discuss their use in finalizing the schedule for the project.

*****END*****

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5th SEMESTER

END SEMESTER EXAMINATION

MC – 303

Financial Engineering

Time : 3 hrs

Roll No. 2K12/MC/48

B.Tech (MC- Engg.)

Nov 2014

Max. Marks: 70

Note: Q.No.1 is compulsory, answer any other three questions.

Statistical table is allowed. Assume missing data, if any.

1. (a) The current price of gold is Rs.25000 per 10 gm. The storage costs is Rs.200 per gm per year payable quarterly in advance. Assuming that constant interest rate of 9% compounded quarterly, calculate the forward price of gold for delivery in nine months. 4
- (b) A non-dividend paying stock is currently selling at Rs. 100 with annual volatility 20%. Assume that the continuously compounded risk-free interest rate is 5%. Using a two period CRR binomial option pricing model, find the price of one European call option on this stock with a strike price of Rs. 80 and time to expiration 4 years. 6
- (c) Consider a portfolio of two assets a_1 & a_2 with the following statistical parameters $\mu_1=5\%$, $\mu_2=10\%$, $\sigma_1=10\%$, $\sigma_2=40\%$, $\rho_{12} = -0.05$. Find the value of minimum risk, the expected return and weight of the assets. 6
- (d) The stock price is Rs.100. The annual continuously compounded risk free interest rate is 5% and the annual volatility relevant for the Black Scholes formula is 30%. Call options are written with a strike price of Rs.80 and time to expiration of 5 years. The stock will pay a dividend of Rs.20 in 2 years and another dividend of Rs. 30 in 3 years. Use the Black – Scholes formula to find the price of one such call option. 6
- (e) Find the stochastic differential equation of $\cos(W(t))$ using Ito – Doeblin formula of version two. 6
2. (a) Define risk neutral probability, obtain its expression. Prove that under risk neutral probability after nth period 7
- $$E[S(n)] = S(0)[1 + E\{K(1)\}]^n$$

- (b) Let $S(0) = \$50$, $r = 5\%$, $u = 0.3$ and $d = -0.1$. Find the price of a European call and put with strike price $X = 60$ dollars to be exercised after $N = 3$ time steps using CRR- formula. 7
3. (a) Let $\{S_n, n=0,1,2,\dots\}$ be a symmetric random walk and F_n be a filtration. Show that $Y_n = (-1)^n \cos(\pi S_n)$ is a martingale with respect to F_n . 7
- (b) Evaluate $\int_0^T W(t) dW(t)$ using quadratic variation. 7
4. (a) A stock being sold for Rs.45 and risk free interest rate is 6% and assume that a dividend of Rs.2 is paid after six months. Find the forward price of the contract on this stock with a delivery date as one year. Also find its value after nine months. 7
- (b) State and prove the Put – Call parity formula for European call and put option, with current price of stock $S(0)$ and exercise price X and exercise time T . 7
5. (a) For two asset portfolio prove that the variance of the portfolio can not exceed the greater of the variances σ_1^2 & σ_2^2 of the component assets. 7
- (b) Using the following data: 7
- | Scenario | Probability | Return K1 | Return K2 |
|-------------------------|-------------|-----------|-----------|
| ω_1 (recession) | 0.4 | -10% | 20% |
| ω_2 (stagnation) | 0.2 | 0% | 20% |
| ω_3 (boom) | 0.4 | 20% | 10% |
- Find the weights in a portfolio with expected return $\mu_p = 46\%$ and compute the risk of this portfolio

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Roll No. MC/009

FIFTH SEMESTER

B.Tech. (MC)

END SEMESTER EXAMINATION

November-2014

MC-304 Internet and Network Security

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any **Five** questions.
Assume suitable missing data, if any.

- Q1. a) Explain the signing and verifying functions of a Digital Signature Algorithm (DSA)? (8)
- b) Explain the concept of Dual signature with respect to Web Security? (6)
- Q2. a) Define Message Authentication. Explain Message Authentication Code (MAC) and one-way Hash Function? (7)
- b) With neat diagram, briefly explain the types of firewalls? (5)
- c) Which are the two ways to achieve Digital Signature? Explain in brief. (2)
- Q3. a) With a schematic diagram, explain the S-DES encryption and decryption process, highlighting the key generation phase? (8)
- b) Explain P-Boxes and S-Boxes in Block Ciphers? Also explain Block Cipher as a permutation group. (6)
- Q4. a) Distinguish between conventional and public key encryption methods? (8)
- b) Describe briefly the Hill cipher. Find out the message from Cipher Text "POHOP" using key
- $$\begin{pmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{pmatrix}$$
- (6)
- Q5. a) In a public key system using RSA, the cipher text received is 10. With a public key (e=5, n=35), deduce the plain text. Verify the answer by encryption process. (8)
- b) Comment on the security of Hash function and MAC? Explain Birthday Attack? (6)
- Q6. a) Explain the transport and tunnel modes in AH? (8)
- b) Describe Transmission and Reception of message using Email Compatibility? (6)

✓ Q7. Explain any four:

(3.5 x 4)

✓ a) SSL Record Protocol ✓

b) Confusion and Diffusion

✓ c) Double DES and Triple DES ✓

✓ d) OSI Reference Model ✓

e) Key Distribution using Certificate Authority

✓ f) SET ✓

g) PGP

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Roll No. M.C.1009

FIFTH SEMESTER

B.Tech. (MC)

END SEMESTER EXAMINATION

November-2014

MC-305 DATABASE MANAGEMENT SYSTEM

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any Five questions.

Assume suitable missing data, if any.

Q1. a) Construct a B+-tree for the following set of key values:

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

Assume that the tree is initially empty and values are added in ascending order. Construct B+-trees for the cases where the number of pointers that will fit in one node is Four. (7)

b) Short note on Lossless Join Property and Dependency Preserving Property. (7)

Q2. a) Consider the following relation

CAR-SALE (Car#, Data-sold, Salesman#, Commission%, Discount-amount)

Assume that a car may be sold by multiple salesmen, and hence (Car#, Salesman#) is a primary key. Additional dependencies are

Data-sold \rightarrow Discount-amount

Salesman# \rightarrow Commission%

Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why or why not? How would you successively normalize it completely? (7)

b) Explain the architecture of a Database system? What are different components of Database system? (7)

Q3. a) Differentiate between Static and Dynamic Hashing. (7)

b) What is a cascadeless schedule? Why is cascadelessness of schedules desirable? (7)

Q4. a) Consider the following schedules. The actions are listed in the order they are scheduled, and - prefixed with the transaction name.

S1: T1:R(X), T2:R(X), T1:W(Y), T2:W(Y), T1:R(Y), T2:R(Y)

S2: T3:W(X), T1:R(X), T1:W(Y), T2:R(Z), T2:W(Z), T3:R(Z)

For each of the schedules, answer the following questions:

- (i) What is the precedence graph for the schedule? (7)
- (ii) Is the schedule conflict-serializable? If so, what are all conflict equivalent serial schedules? (7)
- b) Justify the need for Normalization with examples. What is FD? Explain its role in Normalization. (7)

Q5. a) A university registrar's office maintains data about the following entities:

- (i) courses, including number, title, credits, syllabus, and prerequisites; (ii) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (iii) students, including student-id, name, and program; and (iv) instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.

Construct an E-R diagram for the registrar's office. (6)

(b) Explain Ordered Indices. (4)

(c) Explain different Relational Algebra operations (4)

Q6. a) Consider the following relation (4x2)

Employee (Employee-name, Company-name, Salary)

Write SQL for the following:

- (i) Find the total salary of each company.
- (ii) Find the employee name who is getting lowest salary.
- (iii) Find the company name which has lowest average salary.
- (iv) Find the employee name whose salary is higher than average salary of TCS.

b) Explain the ACID properties of a Transaction? Also, define the states of a Transaction. (6)

Q7. Write short notes (any four) (14)

- (a) Role of Database Administrator
- (b) Mapping ER-model to Relational Model
- (c) Data Models
- (d) Difference between candidate, primary, super keys
- (e) Data dictionary