48

Total No. of Pages: 01

Roll No: .....

FIFTH SEMESTER **B.Tech.**

SUPPLEMENTARY EXAMINATION (April, 2016)

MC-301, Modern Algebra

Time: 3 Hours Max. Marks: 70

Note: Attempt any seven questions. All questions carry equal marks.

(1) *Define a Cyclic group with an example and show that every subgroup of a cyclic group is cyclic.*

(2) *Define a coset with an example. State and prove Lagrange's theorem.*

(3) *State and prove first fundamental theorem of group isomorphism.*

(4) *Define a permutation group with an example. State and prove Caley's theorem.*

(5) *Define an integral domain with an example. Show that every finite integral domain is a field.*

(6) *Define prime ideal with an example and show that if P is a prime ideal of $\mathbb{Z}$ iff either $P = 0$ or $P = p\mathbb{Z}$ for some prime p.*

(7) *Define Maximal ideal with an example. Let R be a commutative ring with 1. Show that an ideal M is a maximal ideal iff R/M is a field.*

(8) *State and prove the embedding theorem.*

(9) *Define unique factorization domain with an example. Show that every Euclidean domain or a principal ideal domain is a unique factorization domain.*

48

Total no. of pages :2

Roll No. _____

5th SEMESTER

B.Tech (MC- Engg.)

SUPPLEMENTARY EXAMINATION

APR 2016

MC – 303 Financial Engineering

Time : 3 hrs

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.28000 per 10 gm. The storage costs is Rs.1.50 per gm per year payable quarterly in advance. Assuming that constant interest rate of 8% compounded quarterly, calculate the forward price of Silver for 1kg 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 7%. 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. 110 and time to expiration 2 years. 6

(c) Consider a portfolio of two assets a_1 & a_2 with no short sell, with the following statistical parameters $\mu_1 = 5\%$, $\mu_2 = 9\%$, $\sigma_1 = 22\%$, $\sigma_2 = 37\%$, $\rho_{12} = -0.05$. 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 8% and the annual volatility relevant for the Black Scholes formula is 25%. Call options are written with a strike price of Rs.80 and time to expiration of 5 years. Use the Black – Scholes formula to find the price of one such call option. 6

(e) Find the stochastic differential equation of $Sin(W(t))$ using Ito – Doeblin formula of version two. 6

2. (a) Define risk neutral probability, obtain its expression. 7

(b) Let $S(0)$ = Rs.100, r = 10%, u = 0.2 and d = −0.2. Find the price of a European call and put with strike price X = Rs.120 to be exercised after N = 2 time steps using CRR- formula. 7

3. (a) Let $\{N(t), t \geq 0\}$ be a Poisson Process with parameter λ. Decide that $\{N(t), t \geq 0\}$ is a martingale or not. 7

(b) Evaluate $\int_0^T W(T)dW(t)$ using the first version of Ito-Deoblin formula. 7

4. (a) A stock being sold for Rs.50 and risk free interest rate is 9%and assume that a dividend of Rs.2 is paid after 3 months. Find the forward price of the contract on this stock with a delivery date as 9-months. 7

(b) Discuss the dependency of Call and Put price for European option on exercise price X, with current price of stock S(0) 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, if there is no short sell. 7

(b) Using the following data: 7

Scenario	Probability	Return $K1$	Return $K2$
$\omega 1$ (recession)	0.3	−10%	20%
$\omega 2$ (stagnation)	0.2	0%	20%
$\omega 3$ (boom)	0.5	20%	10%

Find the weights in a portfolio with expected return μ_v=30% and compute the risk of this portfolio