ASSIGNMENT QUESTIONS (SEMESTER 4)

FUNCTIONAL ANALYSIS
Course code: MM242

1.Show that an operator T on a Hilbert Space H is unitary iff T(e_i) complete orthonormal set whenever $\{e_i\}$ is.

2. Prove that $T1$ and $T2$ are self adjoint operators on a Hilbert space H, prove that $T1$ $T2$ +$T2$ $T1$ is self adjoint

3) Let T be a normal operator on a finite dimensional Hilbert space H with spectrumλ_1, λ_2, … … , λ_m , . Then prove that
i) T is self - adjoint ⇔ each λi,,is real.
ii) T is positive ⇔ each $\lambda i \geq 0$
iii) T is unitary ⇔λi =1 for each .

4) Show that the self adjoint operator is continuous map

5) Prove that a Hilbert space is seperableiff every ortho normal set in H is countable.

6) Show that an idem potent operator on a Hilbert space H is a projection on H iff it is normal.
7) Let x_1 x_2 … . . x_n, be an orthonormal set in X and k_1 ,k_2,. … … … k_n be scalars having absolute value 1. Then $k_1x_1 + k_2x_2 + \cdots \ldots k_nx_n = x_1 + \cdots + x_n$

Analytic Number Theory

Course code : MM244

1) Show that $\sum_{n=1}^{\infty} {}^{1}/{}_{p_n}$ diverges
2) Define Mobiousfunction,Eulers function Also find $\mu(100)$, $\mu(12600)$,$\varphi(100)$, $\varphi(1200)$
3) Define Mangoldt function$\Lambda(n)$ Find $\Lambda(1250)\Lambda(200)$
4) State and prove Chinees Reminder Theorem
5) Find quadratic residue modulo 29 ,modulo 37
6) State and prove Gauss's Lemma
7) Find all primes for which 3 is a quadratic residue
8) Find $\left[\frac{888}{1999}\right]$
9) Find the primitive root of 71
10) Prove that2^{α}has no primitive roots for $\alpha \geq 3$

COMPLEX ANALYSIS-ll

Course Code: MM 241

1)Prove that Π(1+Zn) converges absolutely iff Π(1+|Zn |) converges.

2) Prove that A set is normal if and only if its closure is compact.

3)A region $G_1$is conformally equivalent to G_2 if there is an analytic function f : G_1→C such that f is one to one and $f(G_1)=G_2$ .Prove that this is an equivalent relation

4)let f be an analytic on G ={z:Rez>0} one one with Re f(z) >0 for all z in G and f(a)= a for some real number a show that|f'(a)|=< 1

5)Prove that limz→0(log(1+z))/z =1

6)show that $\prod_{n=2}^{\infty}(1-1/n^2)$ =1/2

7) Let f and g be analytical functions on a region G and show that there are analytical functions f_1,g_1, and h on G such that f(z)=h(z) f_1(z)and g(z)=h(z)g_1(z) for all z in G ; and f_1 and g_1 have no common zeros

Coding theory

Course code : MM243

1) For *n=3 and C*=$\{000,111,110\}$. For each word in K^3 that could be received ,find the word v in the code C which IMLD will conclude was sent
2) Write the vector 0011 as a unique linear combination of the words $\{1000,1100,1110,1111\}$
3) Let H=$\begin{bmatrix}1&1\\1&1\\0&1\\1&0\\0&1\end{bmatrix}$ for the PCM for linear code C, find a) generator matrix for $C^{\perp}$ b) a parity check matrix for $C^{\perp}$ c) a generator matrix for C
4) Find a parity check matrix for C=$< S >, S = \{10101,01010,11111,00011,10110\}$
5) Explain Golay code and find weight of C_{23}
6) Define Reed Mullers Codes and find G(2 3)
7) Find generating and Parity check matrix for an extended hamming code of length 8
8) Find the generator polynomial of the code spanned by S=$\{010,011,111\}$

9) Let $g(x) = 1 + x^4 + x^6 + x^7 + x^8$ *is the generator polynomial for a cyclic code with* $d + 5, n = 15$,.

$$Decode\ the\ word\ w = 110011100111000$$

10) If *f(x)*=$1 + x + x^2$,find $[f(x)]^4$

11) Construct GF(2^4) using $h(x) = 1 + x + x^4$

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