

COMPSCI 367 Assignment 2

Prototype Knowledge-Based System

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Introduction to Domain

The domain chosen is called the DSM-IV Classification and is used to in diagnosing a patient's mental disorder(s) and to rule out other mental disorders.

It is intended to be relevant in a wide array of circumstances and used by clinicians and researchers of many different orientations (e.g., biological, psychodynamic, cognitive, behavioural, interpersonal, family/systems). DSM-IV is designed for use across different settings, inpatient, outpatient, partial hospital, consultation-liaison, clinic, private practice, and primary care, and with community populations and by psychiatrists, psychologists, social workers, nurses, occupational and rehabilitation therapists, counsellors, and other health and mental health professionals.

The various types of disorders are:

- Disorders due to a General Medical Condition (A nodes).
- Substance-Induced Disorders (B nodes).
- Psychotic Disorders (C nodes).
- Mood Disorders (D nodes).
- Anxiety Disorders (E nodes).
- Somatoform Disorders (F nodes).

Knowledge Sources and Methods of Elicitation

Elicitation of the knowledge was done through the Internet, and various books. Knowledge was also obtained from my partner, as she is studying to be a nurse, and is currently working at a mental hospital, because of this I considered her to be an expert. She helped to ensure that the system made sense and is easy to understand.

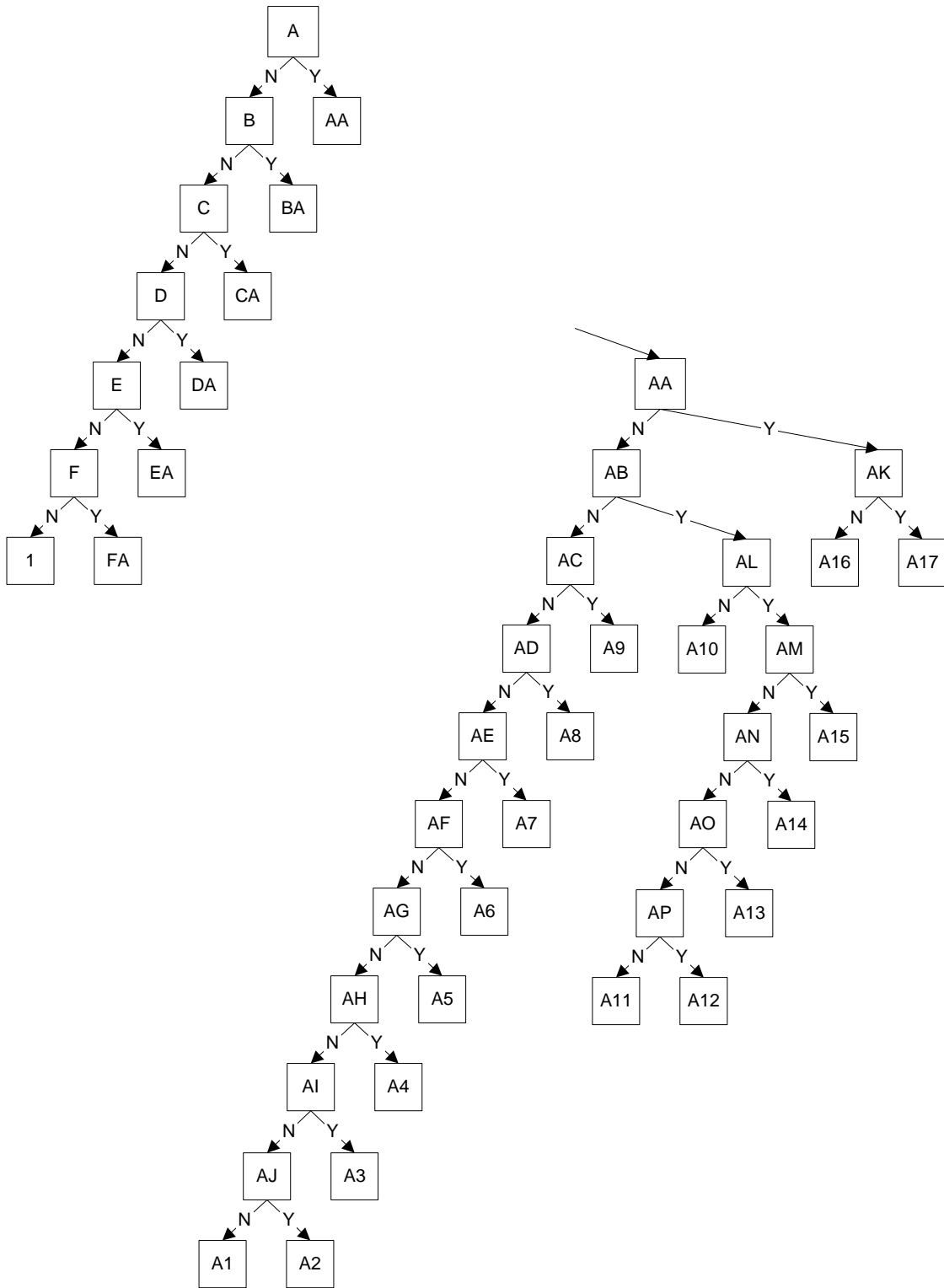
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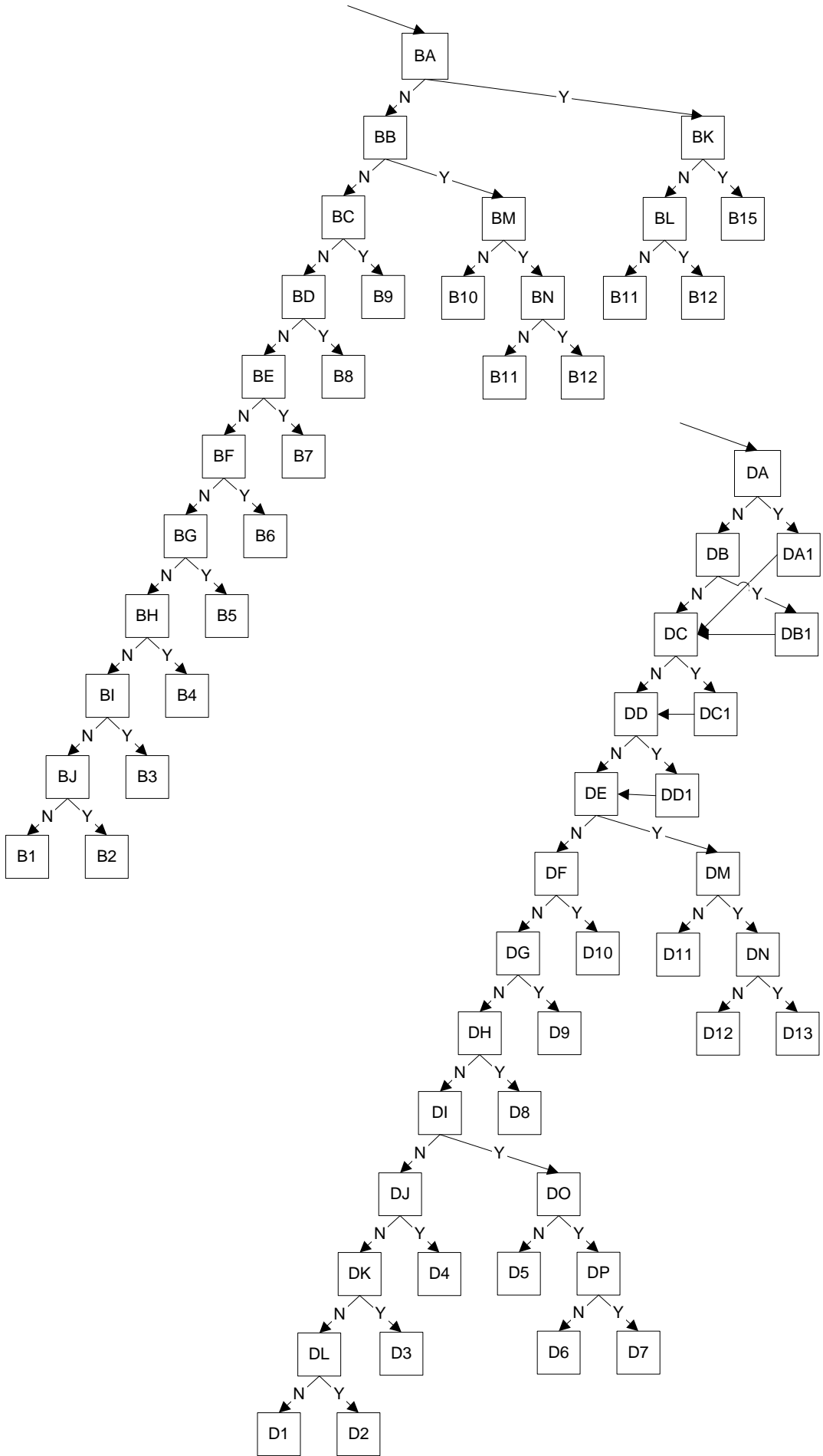
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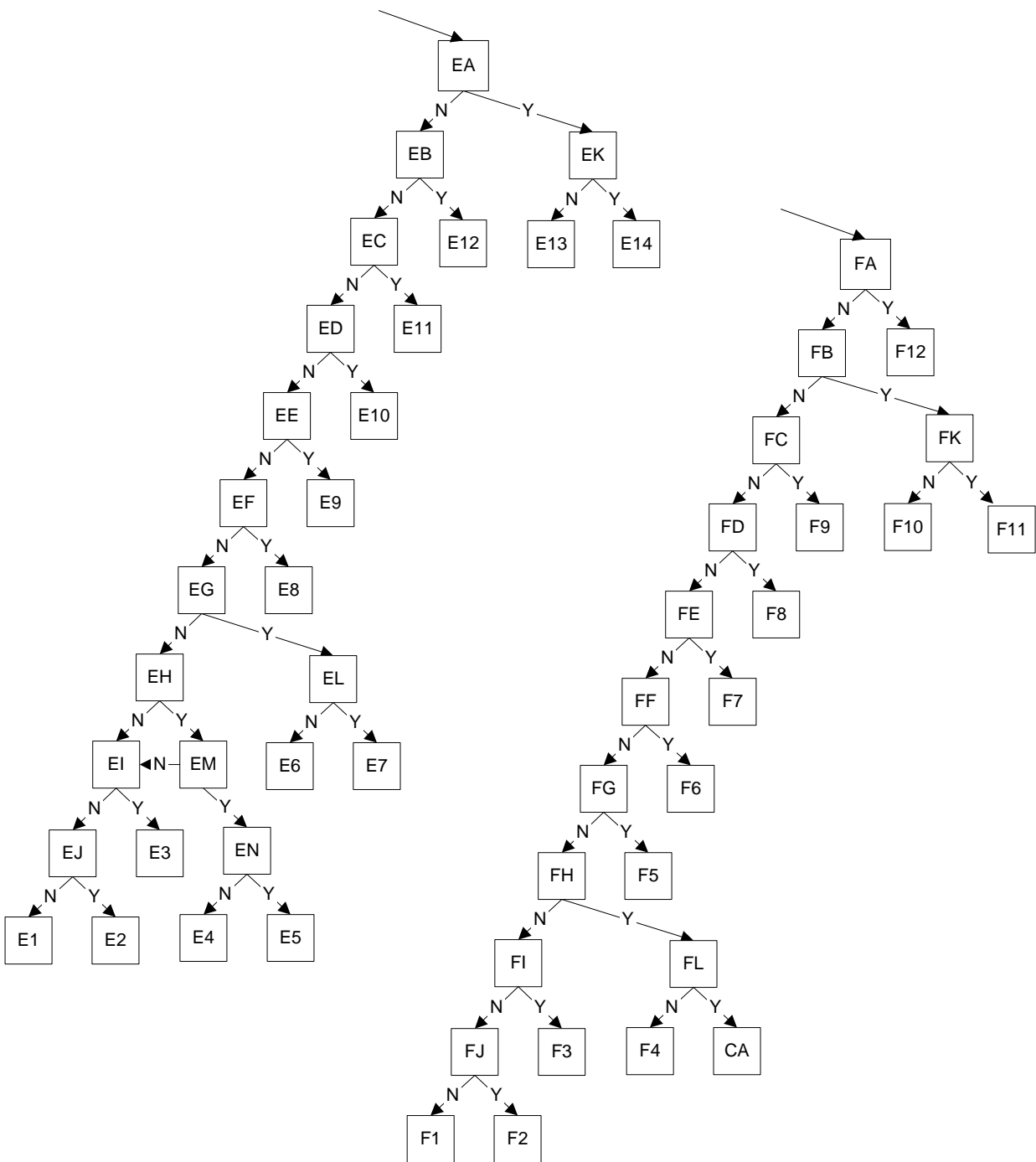
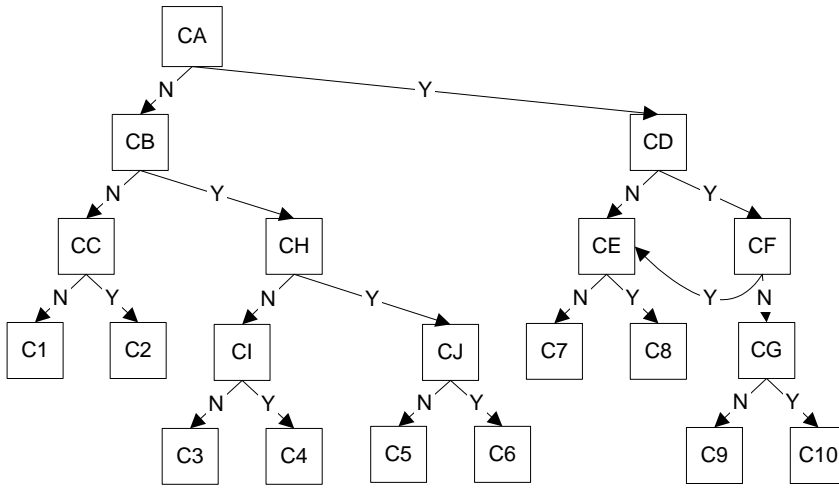
Books include:

- Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR (Text Revision), by Task Force on DSM-IV, American Psychiatric Association.
- DSM-IV Made Easy by James Morrison.
- Interview Guide for Evaluating DSM-IV Psychiatric Disorders and the Mental Status Examination by Mark Zimmerman.

Intermediate Knowledge Level Representation – Decision Trees







Knowledge description (using pseudocode (IF THEN rules))

```
If A then AA else B      If CF then CE else CG      If FG thenF5 else FH
If B then BA else C      If CG then C10 else C9     If FH thenFL else FI
If C then CA else D      If CH then CJ else CI     If FI thenF3 else FJ
If D then DA else E      If CI then C4 else C3     If FJ thenF2 else F1
If E then EA else F      If CJ then C6 else C5     If FK thenF11 else F10
If F then FA else 1      If DA then DA1 else DB    If FL thenCA else F4
If AA then AK else AB    If DB then DB1 else DC    If C9 thenDA
If AB then AL else AC    If DC then DC1 else DD    If DA1 thenDC
If AC then A9 else AD    If DD then DD1 else DE    If DB1 thenDC
If AD then A8 else AE    If DE then DM else DF     If DC1 thenDD
If AE then A7 else AF    If DF then D10 else DG    If DD1 thenDE
If AF then A6 else AG    If DG then D9 else DH     If D13 thenCA
If AG then A5 else AH    If DH then D8 else DI     If D12 thenCA
If AH then A4 else AI    If DI then DO else DJ     If D7 thenCA
If AI then A3 else AJ    If DJ then D4 else DK     If D6 thenCA
If AJ then A2 else A1    If DK then D3 else DL     If E7 then
If AK then A17 else A16  If DL then D2 else D1     If F3 thenCA
If AL then AM else A10   If DM then DN else D11
If AM then A15 else AN   If DN then D13 else D12
If AN then A14 else AN   If DO then DP else D5
If AO then A13 else AO   If DP then D7 else D6
If AP then A12 else A11  If EA then EK else EB
If BA then BK else BB    If EB then E12 else EC
If BB then BM else BC    If EC then E11 else ED
If BC then B9 else BD    If ED then E10 else EE
If BD then B8 else BE    If EE then E9 else EF
If BE then B7 else BF    If EF then E8 else EG
If BF then B6 else BG    If EG then EL else EH
If BG then B5 else BH    If EH then EM else EI
If BH then B4 else BI    If EI then E3 else EJ
If BI then B3 else BJ    If EJ then E2 else E1
If BJ then B2 else B1    If EK then E14 else E13
If BK then B15 else BL   If EL then E7 else E6
If BL then B14 else B13  If EM then EN else EI
If BM then BN else B10   If EN then E5 else E4
If BN then B12 else B11  If FA then F12 else FB
If CA then CD else CB    If FB then FK else FC
If CB then CH else CC    If FC then F9 else FD
If CC then C2 else C1    If FD then F8 else FE
If CD then CF else CE    If FE then F7 else FF
If CE then C8 else C7    If FF then F6 else FG
```

List of Rules in CLIPS syntax

- Whenever a question or answer appears in “”, please refer to the list of values in the appendices.

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(node (name EA) (type decision) (question "EA") (yes-node EK) (no-node EB) (answer nil))
```


Test problems

Patient has had Delusions and Catatonic Behaviour that has lasted longer than 6 months, has no general medical condition and does not abuse drugs or medication. This results in a diagnosis of **Schizophrenia Disorder**.

Inputs: No, No, Yes, Yes, No, Yes.

Output: Schizophrenia Disorder.

Patient has an irritable mood that has lasted 4-6 days, depression for more than 2 weeks, has no general medical condition, does not abuse drugs or medication, has never had a manic or mixed episode, but a hypomanic and major depressive episode. This results in a diagnosis of **Bipolar II Disorder**.

Inputs: No, No, No, No, Yes, Yes, No, No, Yes.

Output: Bipolar II Disorder.

Installation Instructions

Should be able to run on any operating system that can run JESS.

Ensure all files are in the main JESS directory and then just run using the following instructions.

- java jess.Console
- (batch disorders.clp)

Questions can then be answered using “yes” or “no” answers to obtain a diagnosis.

Problems and Observations

It was fairly difficult finding all the information for the domain, this was probably due to the size of the domain. I considered narrowing the domain, but I thought it would not be complete if reduced at all.

It is fairly interesting to note that if the questions are asked on yourself how you can have some symptoms but not have them last long enough or have enough of them to be diagnosed with a disorder. This is fairly scary, as it is also fact that 1 in 5 are diagnosed with a disorder.

Appendix

List of question and answer values.

- 1 **No Disorder Found.**
- A Symptoms due to a general medical condition?
- A1 **No Mental Disorder Due To A General Medical Condition.**
- A10 **SEE:** Amnestic Disorder Due To A General Medical Condition.
- A11 **SEE:** Dementia NOS.
- A12 **SEE:** Dementia Of The Alzheimer's Type.
- A13 **SEE:** Dementia Due To A General Medical Condition.
- A14 **SEE:** Vascular Dementia.
- A15 **SEE:** Dementia Due To Multiple Etiologies.
- A16 **SEE:** Delirium Due To A General Medical Condition.
- A17 **SEE:** Delirium Due To Multiple Etiologies.
- A2 **SEE:** Mental Disorder NOS Due To A General Medical Condition.
- A3 **SEE:** Personality Change Due To A General Medical Condition.
- A4 **SEE:** Catatonic Disorder Due To A General Medical Condition.
- A5 **SEE:** Sleep Disorder Due To A General Medical Condition.
- A6 **SEE:** Sexual Dysfunction Due To A General Medical Condition.
- A7 **SEE:** Anxiety Disorder Due To A General Medical Condition.
- A8 **SEE:** Mood Disorder Due To A General Medical Condition.
- A9 **SEE:** Psychotic Disorder Due To A General Medical Condition.
- AA Disturbance in consciousness and cognitive changes?
- AB Impairment in memory?
- AC Delusions or hallucinations?
- AD Persistent mood disturbance?
- AE Persistent anxiety, panic attacks, or obsessions / compulsions?
- AF Clinically significant sexual dysfunction?
- AG Clinically significant disturbance in sleep?
- AH Catatonic?
- AI Personality changes?
- AJ Clinically significant symptoms etiologically in nature and related to the general medical condition?
- AK Evidence of more than one etiology?
- AL One or more cognitive deficits?
- AM Evidence of more than one etiology?
- AN Evidence of cerebrovascular disease etiologically related to disorder?
- AO Evidence of central nervous system disorder or a systemic disorder that is known to be related to dementia?
- AP Evidence of continuing cognitive decline with a gradual onset?
- B Are the symptoms due directly to substance? (e.g. Drug abuse, alcohol abuse, ...)
- B1 **No Substance-Induced Disorder.**
- B10 **SEE:** Substance-Induced Persisting Amnestic Disorder.
- B11 **SEE:** Substance-Induced Persisting Dementia.
- B12 **SEE:** Dementia Due To Multiple Etiologies.
- B13 **SEE:** Substance-Induced Intoxication Delirium.
- B14 **SEE:** Substance-Induced Withdrawal Delirium.
- B15 **SEE:** Delirium Due To Multiple Etiologies.
- B2 **SEE:** Substance Related Disorder NOS.
- B3 **SEE:** Substance withdrawal.
- B4 **SEE:** Substance Intoxication.

- B5 **SEE:** Substance-Induced Sleep Disorder.
- B6 **SEE:** Substance-Induced Sexual Dysfunction.
- B7 **SEE:** Substance-Induced Anxiety Disorder.
- B8 **SEE:** Substance-Induced Mood Disorder.
- B9 **SEE:** Substance-Induced Psychotic Disorder.
- Disturbance in consciousness and cognitive changes, in excess of what's normally seen in
- BA intoxication or withdrawal?
- BB Ongoing impairment of memory?
- BC Delusions or hallucinations, in excess of what's normally seen in intoxication or withdrawal?
- BD Disturbance in Mood, in excess of what's normally seen in intoxication or withdrawal?
- Anxiety, Panic Attacks, or Obsessions / Compulsions actions, in excess of what's normally seen
- BE in intoxication or withdrawal?
- BF Clinically significant sexual dysfunction?
- BG Clinically significant disturbance in sleep?
- BH Symptoms from recently taking a substance and the symptoms are reversible?
- BI Symptoms due to reduction or stoppage, from taking the substance?
- BJ Clinically significant symptoms due to a substance(s)?
- BK Disorder in more than one etiology?
- BL Delirium started during withdrawal?
- BM Deficit in one or more cognitive areas?
- BN Disorder in more than one etiology?
- Symptoms include delusion(s), disorganised speech, grossly disorganised
- C behavior, or hallucination(s)?
- C1 **SEE:** *Psychotic Disorder NOS.*
- C10 **SEE:** Schizoaffective Disorder.
- C2 **SEE:** Brief Psychotic Disorder.
- C3 **SEE:** *Psychotic Disorder NOS.*
- C4 **SEE:** [Mood Disorder With Psychotic Features. GO TO: Mood Disorder Flow Chart.](#)
- C5 **SEE:** *Psychotic Disorder NOS.*
- C6 **SEE:** Delusional Disorder.
- C7 **SEE:** Schizophreniform Disorder.
- C8 **SEE:** Schizophrenia Disorder.
- C9 **SEE:** [Mood Disorder With Psychotic Features. GO TO: Mood Disorder Flow Chart.](#)
- CA One month or more of Schizophrenia active phase symptoms?
- CB One month or more of Non-bizarre delusions?
- CC Symptoms more than 1 day but less than 1 month?
- CD During Active phase, Major depressive or Manic Episode present?
- CE Symptoms 6 months or more?
- CF Duration of mood episode much less than the duration of the active and residual symptoms?
- CG Symptoms of delusions or hallucinations, with no prominent mood symptoms, 2 weeks or more?
- CH Duration of mood episode much less than the duration of the delusions?
- CI Delusions concurrent with mood episode?
- CJ Delusions but no other marked impairment?
- D Symptoms include depression, heighten, or irritable mood?
- D1 **No Mood Disorder.**
- D10 **SEE:** Bipolar II Disorder.
- D11 **SEE:** Bipolar I Disorder.
- D12 **SEE:** [Bipolar Disorder NOS. \(Superimposed on a Psychotic Disorder\) GO TO: Psychotic Flow Chart.](#)
- D13 **SEE:** [Schizoaffective Disorder, Bipolar Type. GO TO: Psychotic Flow Chart.](#)
- D2 **SEE:** Depressive Disorder NOS.
- D3 **SEE:** Adjustment Disorder With Depressed Mood.
- D4 **SEE:** Dysthymic Disorder.
- D5 **SEE:** Major Depressive Disorder.

D6 [SEE: Depressive Disorder NOS. \(Superimposed on Psychotic Disorder\) GO TO: Psychotic Flow Chart.](#)

D7 [SEE: Schizoaffective Disorder, Depressive Type. GO TO: Psychotic Flow Chart.](#)

D8 **SEE:** Bipolar Disorder NOS.

D9 **SEE:** Cyclothymic Disorder.
Symptoms include 1 or more weeks of hospitalisation or marked impairment of heightened or irritable mood?

DA1 **Manic Episode.**

DB Symptoms include 4 or more days of heightened or irritable mood, less than Manic?

DB1 **Hypomanic Episode.**

DC Symptoms of depression 2 or more weeks, not from Bereavement?

DC1 **Major Depressive Episode.**

DD Symptoms include Manic Episode and Major Depressive Episode, ever day for 1 week or more?

DD1 **Mixed Episode.**

DE Symptoms include a Manic Episode or a Mixed Episode?

DF Symptoms include a Hypomanic Episode and at least 1 Major Depressive Episode?

DG Symptoms include Hypomanic Episodes and depressed mood for at least 2 years?
Symptoms include Hypomanic or Manic Episodes, that are clinically significant but not a specific

DH Bipolar Disorder?

DI Symptoms include a Major Depressive Episode?

DJ Symptoms include more days than not of depressed mood for at least 2 years?

DK Symptoms include depression in response to a stressor?

DL Symptoms include clinically significant depression?

DM Symptoms Psychotic in nature, occur at times other than during Manic or Mixed Episodes?

DN Symptoms only occur during Schizoaffective Disorder?

DO Symptoms Psychotic in nature, occur only during Major Depressive Episodes?

DP Symptoms only occur during Schizoaffective Disorder?

E Symptoms include anxiety, avoidance, fear, or increased arousal?

E1 **No Anxiety Disorder.**

E10 **SEE:** Social Phobia.

E11 **SEE:** Separation Anxiety Disorder.

E12 **SEE:** Agoraphobia Without History Of Panic Disorder.

E13 **SEE:** Panic Disorder Without Agoraphobia.

E14 **SEE:** Panic Disorder With Agoraphobia.

E2 **SEE:** Anxiety Disorder NOS.

E3 **SEE:** Adjustment Disorder With Anxiety.

E4 **SEE:** Acute Stress Disorder.

E5 **SEE:** Posttraumatic Stress Disorder.

E6 **SEE:** Generalized Anxiety Disorder.

E7 **SEE:** Mood Disorder. **SEE:** Psychotic Disorder.

E8 **SEE:** Obsessive-Compulsive Disorder.

E9 **SEE:** Specific Phobia.
Has there been unexpected reoccurring Panic Attacks and at least one month of concern about having another attack?

EA Has there been anxiety about being in a place where escape would be embarrassing or difficult, in the event of another Panic Attack?

EB

EC Has there been anxiety from childhood about being separated from attachment figures?

ED Has there been anxiety about being embarrassed or humiliated in a social or performance setting?

EE Has there been anxiety set off by objects or situations?

EF Has there been Obsessions or Compulsions?
High levels of worry and anxiety for at least six months along with symptom associated with the anxiety?

EG

EH High levels of worry and anxiety do to a severe traumatic event?

EI Anxiety due to a stressor?

EJ Anxiety is clinically significant?

Has there been anxiety about being in a place where escape would be embarrassing or difficult, in the event of another Panic Attack?

EK

EL There is/was a Mood or Psychotic Disorder present in this six month period?

There is an increase in arousal and an avoidance of anything to do with the trauma, plus re-experiencing of the trauma.

EM

EN Symptoms for at least one month?

F Symptoms include complaints or anxiety about illness or appearance?

F1 **No Somatoform Disorder.**

F10 **SEE:** Malingering.

F11 **SEE:** Factitious Disorder.

F12 **Psychological factor affect general medical condition in an adverse way:** Psychological Factors Affecting Medical Condition.

F2 **SEE:** Somatoform Disorder NOS.

F3 [SEE: Body Dysmorphic Disorder. If Delusional GO TO: Psychotic Flow Chart.](#)

F4 **SEE:** Hypochondriasis.

F5 **SEE:** Undifferentiated Somatoform Disorder.

F6 **SEE:** Pain Disorder.

F7 **SEE:** Sexual Dysfunction.

F8 **SEE:** Conversion Disorder.

F9 **SEE:** Somatization Disorder.

There is a general medical condition that explains the physical complaints and the physical complaints do not seem excessive?

FA

FB Physical symptoms were self inflicted or produced?

FC Symptoms of at least: 4 pain, 2 gastrointestinal, 1 sexual, and 1 pseudoneurological?

FD Symptoms affecting voluntary motor or sensory function?

FE Symptoms affecting sexual function?

FF Pain centre of clinical attention and psychological factor play an important role?

FG Six or more months of physical complaints?

FH There is a preoccupation of having a serious disease?

FI Preoccupation with an imagined defect in appearance?

FJ Symptoms clinically in nature?

FK Absents of external incentives?

FL Preoccupation is delusional?