KATHMANDU UNIVERSITY
End Semester Examination
05 January 2024

Level : B.E.
Year : IV
Time : 2 hrs. 30mins.

Course : GEOM 406
Semester : I
F. M. : 40

SECTION "B"

[6 Q × 4 = 16 marks]

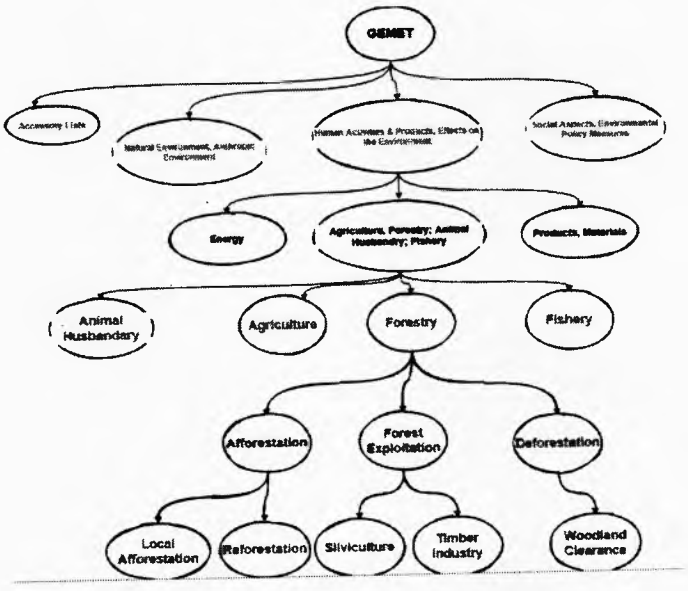
Attempt *ANY SIX* questions.

1. Briefly describe the components of SDI in short.

2. Why is it important to take consideration of standards while designing SDI? List some data and metadata standards that can be implemented while designing an SDI and explain any one of each in brief. [2+2]

3. Suppose you are given the responsibility of geoportal development for an SDI. Among different software available for geoportal development what software would you prefer and why? How would your geoportal look like, what basic features you would include in the portal? [2+2]

4. Define: vocabularies, gazetteers and thesauri. Describe the figure given on the side: what is it showing. Explain the benefit of using such hierarchical concept of vocabulary in SDI. [2+1+1]



5. Describe the principles guiding SDI development. [2×2=4]

6. Write short notes on *ANY TWO* :
   a. Global and regional level SDI
   b. Levels of metadata
   c. Interoperability in SDI

7. What do you understand by Geospatial data catalogue, describe its components briefly with suitable figures where possible?

SECTION "C"

[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Discuss on how successful/unsuccessful the current SDI of Nepal is- in comparison to how it was envisioned in the past. List some aspects that can still be improved in terms of technical, organizational and policy aspects to make the SDI more effective? [3+5]

9. "Metadata is the data about data". Explain this statement. *(Hint: Support your answer by stating several components a metadata record).* How is metadata valuable for an SDI? [5+3]

10. The SDI of USA Government provides some OWS (OGC web service) to access Cadastral data

    - Below is one request sent and corresponding respond. What is this request about and what can you find from response given below. [1+1]

Request:

https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-b656133a018f/services/ogc/wfs?SERVICE=wfs&REQUEST=GetCapabilities&VERSION=1.0.0

Response


```
WFS_Capabilities xmlns="http://www.opengis.net/wfs" xmlns:ogc="http://www.opengis.net/ogc"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.0.0" updateSequence="0"
xsi:schemaLocation="http://www.opengis.net/wfs http://schemas.opengis.net/wfs/1.0.0/WFS-capabilities.xsd">
 <!--  MapServer version 6.0.3 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=KML SUPPORTS=PROJ SUPPORTS=AGG SU
<Service>
  <Name>MapServer WFS</Name>
  <Title>land_grants</Title>
  <Abstract>WFS Service for RGISARCHIVE dataset Bureau of Land Management Land Grant Boundaries
  (3d23ac95-2b28-4c1f-b5cc-b656133a018f)</Abstract>
  <Keywords> RGISARCHIVE New Mexico </Keywords>
  <OnlineResource>https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
  b656133a018f/services/ogc/wms</OnlineResource>
  <Fees>None</Fees>
  <AccessConstraints>none</AccessConstraints>
</Service>
<Capability>
 ▼<Request>
  ▼<GetCapabilities>
   ▼<DCPType>
    ▼<HTTP>
      <Get onlineResource="https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
      b656133a018f/services/ogc/wfs?"/>
     </HTTP>
    </DCPType>
   ▶<DCPType>
    ...
    </DCPType>
  </GetCapabilities>
  ▼<DescribeFeatureType>
   ▼<SchemaDescriptionLanguage>
     <XMLSCHEMA/>
    </SchemaDescriptionLanguage>
   ▼<DCPType>
    ▼<HTTP>
      <Get onlineResource="https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
      b656133a018f/services/ogc/wfs?"/>
     </HTTP>
    </DCPType>
   ▼<DCPType>
    ▼<HTTP>
      <Post onlineResource="https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
      b656133a018f/services/ogc/wfs?"/>
     </HTTP>
    </DCPType>
  </DescribeFeatureType>
 ▼<GetFeature>
  ▼<ResultFormat>
     <GML2/>
    </ResultFormat>
  ▼<DCPType>
   ▼<HTTP>
      <Get onlineResource="https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
      b656133a018f/services/ogc/wfs?"/>
     </HTTP>
```

```
        </DCPType>
      </GetFeature>
    </Request>
  </Capability>
▼<FeatureTypeList>
  ▼<Operations>
      <Query/>
    </Operations>
  ▼<FeatureType>
      <Name>land_grants</Name>
      <Title>Bureau of Land Management Land Grant Boundaries</Title>
      <Abstract>Bureau of Land Management Land Grant Boundaries</Abstract>
      <Keywords> </Keywords>
      <SRS>EPSG:26913</SRS>
      <LatLongBoundingBox minx="114535" miny="3.46643e+06" maxx="690090" maxy="4.10256e+06"/>
      <MetadataURL type="FGDC-STD-001-1998"
      format="text/xml">https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-
      b656133a018f/metadata/FGDC-STD-001-1998.xml</MetadataURL>
    </FeatureType>
  </FeatureTypeList>
▼<ogc:Filter_Capabilities>
  ▼<ogc:Spatial_Capabilities>
    ▼<ogc:Spatial_Operators>
       <ogc:BBOX/>
     </ogc:Spatial_Operators>
   </ogc:Spatial_Capabilities>
  ▼<ogc:Scalar_Capabilities>
     <ogc:Logical_Operators/>
    ▼<ogc:Comparison_Operators>
       <ogc:Simple_Comparisons/>
       <ogc:Like/>
       <ogc:Between/>
     </ogc:Comparison_Operators>
   </ogc:Scalar_Capabilities>
  </ogc:Filter_Capabilities>
</WFS_Capabilities>
```

- Another request is sent as below:
  https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-4c1f-b5cc-b656133a018f/services/ogc/wfs?SERVICE=wfs&VERSION=1.0.0&REQUEST=GetFeature&TYPENAME=land_grants

  How is this request different from previous request? [1]

  If following is the response obtained from above request answer the questions of next page:

```
▼<wfs:FeatureCollection xmlns:ms="http://mapserver.gis.umn.edu/mapserver"
 xmlns:wfs="http://www.opengis.net/wfs" xmlns:gml="http://www.opengis.net/gml"
 xmlns:ogc="http://www.opengis.net/ogc" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.opengis.net/wfs http://schemas.opengis.net/wfs/1.0.0/WFS-basic.xsd
 http://mapserver.gis.umn.edu/mapserver https://gstore.unm.edu/apps/rgisarchive/datasets/3d23ac95-2b28-
 4c1f-b5cc-b656133a018f/services/ogc/wfs?
 SERVICE=WFS&VERSION=1.0.0&REQUEST=DescribeFeatureType&TYPENAME=land_grants&OUTPUTFORMAT=XMLSCHEMA">
  ▼<gml:boundedBy>
    ▼<gml:Box srsName="EPSG:26913">
       <gml:coordinates>114574.006413,3470970.327983 682824.750423,4102370.733626</gml:coordinates>
     </gml:Box>
   </gml:boundedBy>
   <!--  WARNING: FeatureId item 'FID' not found in typename 'land_grants'.  -->
```

```
▼<gml:featureMember>
  ▼<ms:land_grants>
    ▼<gml:boundedBy>
      ▼<gml:Box srsName="EPSG:26913">
          <gml:coordinates>443983.957248,4043267.377910 444327.700661,4043462.996801</gml:coordinates>
        </gml:Box>
      </gml:boundedBy>
    ▼<ms:msGeometry>
      ▼<gml:Polygon srsName="EPSG:26913">
        ▼<gml:outerBoundaryIs>
          ▼<gml:LinearRing>
              <gml:coordinates>443983.957248,4043355.447650 444005.826482,4043370.491080
              444124.578103,4043462.996801 444327.700661,4043392.501098 444001.920710,4043267.377910
              443983.957248,4043355.447650 </gml:coordinates>
            </gml:LinearRing>
          </gml:outerBoundaryIs>
        </gml:Polygon>
      </ms:msGeometry>
      <ms:AREA>31230.61407730000</ms:AREA>
      <ms:PERIMETER>830.94656256300</ms:PERIMETER>
      <ms:LAND_GRANT>10</ms:LAND_GRANT>
      <ms:LAND_GRA_1>29</ms:LAND_GRA_1>
      <ms:GRANT_NAME>ARROYO HONDO/ANTONIO MARTINEZ/ANTOINE LEROUX</ms:GRANT_NAME>
      <ms:SURVEY_APP>18991230</ms:SURVEY_APP>
      <ms:GRANT_CONF>18991230</ms:GRANT_CONF>
    </ms:land_grants>
  </gml:featureMember>
▼<gml:featureMember>
  ▼<ms:land_grants>
    ▼<gml:boundedBy>
      ▼<gml:Box srsName="EPSG:26913">
          <gml:coordinates>443627.353243,4043107.973628 443817.918039,4043241.232440</gml:coordinates>
        </gml:Box>
      </gml:boundedBy>
    ▼<ms:msGeometry>
      ▼<gml:Polygon srsName="EPSG:26913">
        ▼<gml:outerBoundaryIs>
          ▼<gml:LinearRing>
              <gml:coordinates>443627.353243,4043107.973628 443682.073912,4043200.977471
              443817.918039,4043241.232440 443627.353243,4043107.973628 </gml:coordinates>
            </gml:LinearRing>
          </gml:outerBoundaryIs>
        </gml:Polygon>
      </ms:msGeometry>
      <ms:AREA>5215.62342095000</ms:AREA>
      <ms:PERIMETER>482.12643619200</ms:PERIMETER>
      <ms:LAND_GRANT>11</ms:LAND_GRANT>
      <ms:LAND_GRA_1>28</ms:LAND_GRA_1>
      <ms:GRANT_NAME>ARROYO HONDO/ANTONIO MARTINEZ/ANTOINE LEROUX</ms:GRANT_NAME>
      <ms:SURVEY_APP>18991230</ms:SURVEY_APP>
      <ms:GRANT_CONF>18991230</ms:GRANT_CONF>
    </ms:land_grants>
  </gml:featureMember>
```

a. What is the format of response obtained? How do you identify it? [1]
b. How many attributes does each feature in the data have? Name any two of them. [1]
c. Which tag is enclosing all the attribute and spatial information of each single feature? How many feature data are shown here in the screenshot? [1]
d. If you observe, you can find there are many <gml:boundedBy> tags. How is the first tag different from other <gml:boundedBy> tags enclosed within <gml:featureMemeber> , what information is it showing? [1]
e. In your opinion, how is it beneficial for a SDI to implement these kind of web services? [1]

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05 January 2024

Marks Scored:

Level : B.E.
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Course : GEOM 406
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20Q. × 0.5 =10 marks]

Encircle the most appropriate option from each set of choices

1. Point (X,Y) is a standard for representation of a point geometry object in
   a. WKT format b. WKB format c. Binary format d. JSON format

2. Which of the following statement is **TRUE**?
   a. GML file stores data in form of tags.
   b. GML files are not text file.
   c. GML files can't store multipolygon data.
   d. GML files requires an assistant .xml file for storing attribute data.

3. One of the W3C request that is followed when message is sent from client to server or vice versa in a client server architecture is:
   a. CSS b. HTML c. HTTP d. SVG

4. GET request is used to
   a. get existing resource from server
   b. send data to be server to create/update a resource
   c. update a current resource.
   d. remove a resource.

5. Web services are not designed to support
   a. application to application communication
   b. transfer of raw data between devices over the internet
   c. real time data sharing / creating of real-time web apps
   d. structuring of web pages

6. GetMap can contain which of these following parameters :
   a. typename b. feature_count c. height d. coverageid

7. GetMap, GetCapabilities, GetFeature are all
   a. OWS requests/operation b. OWS parameters
   c. versions d. standards

8. Which of these cannot be the response of WFS request?
   a. .jpg file b. .gml file c. .shp file d. .kml file

9. Which OWS request dose give the details of each individual feature type before requesting the actual data?
   a. DescribeFeatureType b. GetFeature
   c. GetCapabilities d. GetInfo

10. Mediatype is parameter of which OWS service request:
    a. Web Coverage Service
    b. Web Map Service
    c. Web Processing Service
    d. Web Feature Service

11. JTC-1 is an standard for cloud computing developed by:
    a. ISO
    b. OGC
    c. CEN
    d. W3C

12. Content information of metadata record is about.....
    a. data set entities/attributes
    b. spatial extent
    c. geographical content
    d. data models

13. Which of the following is **NOT** an element of metadata record?
    a. resource identifier
    b. abstract
    c. constraints
    d. profile

14. Which of the following send query from client network to all server at different locations, in a geospatial data catalogue.
    a. catalogue gateway
    b. access interface
    c. registering servers
    d. director

15. FAO GeoNetwork is a
    a. Regional Level SDI
    b. Global Level SDI
    c. State Level SDI
    d. Local SDI

16. Which of the following geoportal software utilizes GeoServer as its underlying map server?
    a. GeoNode
    b. GeoNetwork
    c. deegree
    d. CKAN

17. ..... is a metadata standard developed by ESRI
    a. Item description
    b. ISO 19139
    c. FCDC
    d. Inspire profile

18. Among these, which phrase suitably defines the concept of Geoverse
    a. Distributed interconnected systems managed under control of human and AI which consumes data from SDI data catalogues or other web sources.
    b. Machine centered API searches, retrieval and data analysis permitting intelligent interaction between SDI web portals, systems and devices.
    c. Human centered search, retrieval and analysis process via web catalogue
    d. Combination of various versions of geospatial metadata.

19. Which of the following is not one of the 14 fundamental datasets of SDI specified by UNGGIM?
    a. Geology and Soils
    b. Addresses
    c. Geographical Names
    d. Flood risk maps

20. Which of the following is **TRUE** regarding NSDI of Nepal:
    a. The current NSDI data portal of Nepal is operated by a unit under Ministry of Land Management, Cooperatives and Poverty Alleviation.
    b. NSDI of Nepal provides data through OWS web services also.
    c. Administrative Boundary is one of the data provided through the geoportal page of NSDI.
    d. All datasets available in the portal are free to download.