INDIA METEOROLOGICAL DEPARTMENT

QUESTION BANK

OF

ADVANCED METEOROLOGICAL TRAINING COURSE (AMTC) SEMESTER-I EXAMINATION

BASED ON 176-181 BATCHES

(2015-2021)

PAPER-VI: SATELLITE MET., RADAR MET. AND DBM & GIS

PART A AND C

SEMESTER-I Satellite Met., Radar Met.(PART A) DBM & GIS (PART C)

PART A :- SATELLITE METEOROLOGY

Q.1   Fill in the blanks

1. _____ Sensor on INSAT 3D gives the information about vertical structure of the Atmosphere.

2. _____ is the type of T number to be followed in case of lack of availability of clear satellite imagery.

3. _____ clouds are not captured in Visible channel imagery.

4. _____ channel can be used to assess the withdrawal of rainfall.

5. _____ imagery is used for thunderstorm detection.

6. _____ Channel imagery is used for detection of low-medium clouds.

7. _____channel is used for the detection of fog in day time.

8. A set of _____ needed to specify a satellite orbit is called _____.

9. AHI is pay load of ----------------------satellites.

10. Cold clouds appear _____ in the IR imagery. (Darker/Brighter)

11. Cyclonic systems with lower T numbers are _____ (easier / difficult) to interpret as per Dvorak's technique.

12. D.R.T is to used receiving ………....................

13. Data Relay Transponder of INSAT communicate image & sounder information to Earth station at _____Frequency approximately (4500/2500/1500MHZ)

14. Eye in the cyclone is generally not visible when cyclone intensity is less than -----

15. Fog is detected using _____ channel imagery.

16. Full form of L . N . A ....

17. Geo Stationary satellites are placed exactly above _____(Equator / Mid Latitude / Higher Latitudes).

18. Geostationary satellites are not used for monitoring of weather over _____ region.

19. High Clouds can be easily detected using ------------ imagery.

20. IASI stands for _____.

21. IMSRA stands for _____.

22. In CDO pattern centre of cyclone lies _____ cloudy region.

23. In SWIR channel, clouds with higher ice particle content appears _____ .
    (dark/bright)

24. Kepler's third law makes a _____ between the motion characteristics of _____.

25. Land appear dark compared to Ocean in _____ channel imagery.

26. Mega Tropique is placed in a _____ orbit.

27. Percentage of reflection of snow on earth surface at visible channel of imagery is
    _____.(59%-88% / 10% / 5%)

28. Presence of 'eye' of a cyclone in satellite imagery indicates the _____ strength of
    cyclone. (lower/higher)

29. Radio Frequency of IMAGER payload of INSAT-3D ....

30. ROSA stands for _____.

31. Scaterometer payload is an example of ……………. remote sensing.

32. Scatterometer is used to assess winds at _____.

33. The Field of Regard of INSAT-3D Imager is _____ degree.

34. The function of detector is to convert _____ to
    _____.

35. The MMDRPS stand for --.

36. The proposed payload on GISAT-1 satellite is MX-VNIR, HYS-SWIR and --------------------
    ----

37. The range _____ of IR band used to derive humidity profile from
    INSAT 3D sounder.

38. The software used for data backups in IMDPS is _____.

39. The width of one scan line of sounder pay load is _____km.

40. Threshold BTD value in Kelvin to detect night fog over India is ---------.

41. Thunderstorms can be monitored well using _____ satellite.

42. Vis and SWIR bands work on the _____ property of target object.

43. Visible channel of imagery is at _____micrometers wavelength.

44. Visible imagery filters out _____ clouds. (Low/High)

45. Water vapour channel is based on _____ property of the clouds. (Reflection/emission)

46. Water vapour winds are generated on the basis of -------------present in the atmosphere.

47. White Pixel in satellite represents -------------.

Q.2   State with brief reasons whether the following are true or false

1. A single IR1 channel cannot detect fog at night.

2. Atmospheric Profile derived from the sounder for 1x1 pixel.

3. Atmospheric Window is the range of wavelength for which atmosphere behaves like an opaque medium.

4. Carbon dioxide gas (CO_2) spectra is used to drive the humidity profile of atmosphere in remote sensing.

5. Cyclone with EYE formation have T no. more than 3.5.

6. Cyclones with lower intensity are easier to classify using Dvorak technique.

7. Dvorak cannot accurately depict intensity in monsoon systems.

8. Eye pattern is observed in the later stages of cyclone.

9. Geo. Interferometric Infrared Sounder (GIIRS) is first hyper spectral sounder on Suomi-NPP satellite.

10. Geosynchronous satellites are always geostationary.

11. In CDO Pattern, center lies in cloud free region.

12. INSAT3D /3DR satellites are active type of satellites.

13. IR imagery is inverted by satellite processing systems so that black areas on Earth correspond to Higher Temperature and gray/white area corresponds to lower temperature.

14. IR imagery is inverted.

15. IR Power radiated by Earth is proportional to fourth power of Absolute temperature of its surface.

16. Micro wave sounder on Geo-stationary platform is used to derive profile of the atmosphere.

17. Microwave channel can detect the centre of cyclone even in presence of overcast cirrus clouds.

18. Nadir is also called as sub-satellite point.

19. Non spinning satellites once deviating from the desired altitudes can be restored.

20. OLR is also used as one of the parameters for declaring on-set of monsoon over Kerala.

21. OLR is detected directly by the geostationary satellite.

22. Polar satellites are suitable to monitor cyclones.

23. Polar satellites are useful for continuous monitoring of cyclones.

24. Polar sun synchronous Constellation of satellites used internationally consist of FY-2 (Early Morning) + Metop (Mid. Morning) + NPP (Afternoon).

25. SAPHIR pay load of MEGA TROPIQUES is a IR sounder used to derive humidity profile.

26. SEVIRI payload is on GOES-16.

27. Spatial resolution of water vapour channel is finer than SW IR channel.

28. SST can be derived for cloudy pixels.

29. The derivation of SST by using Multi channel will increase the accuracy.

30. The difference in IR1 and WV channel is used for the detection of fog at night time.

31. The Field of Regard of INSAT 3D imager is 10x10 degree.

32. Water vapour imagery of INSAT 3D shows surface to lower level moisture.

Q.3   Answer any two of the following:

1. Different type of satellite orbits and their uses.

2. Draw a neat and clean Block diagram of receiving meteorological data from INSAT-3D at earth station and described all the equipment's function.

3. How the different clouds are analyzed using VIS and IR channels available in the Imager. What is RGB technique?

4. Mention the various channels available in INSAT 3D Imager. Mention the physical properties they are based on and state their use in monitoring different types of weather.

5. Meteorological Data receiving from geostationary satellite are free of noises? Give reason with true   or false.

6. Name the different type winds and wind derived products derived from INSAT-3D/3DR Imager payload   and write the steps for derivation of Winds.

7. Name the types of cyclones. Explain how the Dvorak technique uses the satellite imagery to decide the strength of cyclones. What are different T numbers used in this technique?

8. Principles of remote sensing and its advantages.

9. SIDS.

10. What are the basic elements of Satellite image interpretation? Explain each of them. What are the points to be remembered while analyzing the satellite imagery?

11. What are the basic principles for the interpretation of satellite imageries?

12. What is DTH based DWDS and write its advantages .

13. What is G N S S and its uses in IMD?

14. Which radiometric corrections and geometric corrections are applied while processing in IMDPS.

15. Which type of Antenna used in meteorological data reception of INSAT-3D and why?

16. Working of IMAGER payload.

17. Write a note on different resolutions associated with satellite remote sensing. Comment on their advantages and limitations in monitoring different weather phenomena.

18. Write a note on Dvorak technique

19. Write a note on Dvorak Technique for cyclone classification.

20. Write a note on interpretation of satellite imagery.

21. Write down the main characteristics and uses of Visible, Infrared and water vapour imagery.

22. Write in details about the different cyclonic structures and steps of Dvorak,s Technique

23. Write the recipe of day time and night time micro physics RGB image of INSAT 3D imager.

PART A - RADAR MET.

Q.1   Fill in the blanks

1. …………………….. product of Doppler Weather Radar can be used to identify veering or backing in the wind near the Radar station.

2. Approaching velocities are color coded in _____[red/blue] shades

3. Beam of width radar depends on_____and_____.

4. Bright-band echo is a characteristic signature of _____ precipitation.

5. Bright-Band signature is a characteristic sign/indication of _____[Convective/Stratiform] clouds

6. Considering the wavelength of X-band radar as 3 cm, the most probable size of the antenna would be ………… meter.

7. Ducting is an extreme case of _____ (Sub-refraction / Super-refraction), where the effective radar observational range _____(increases / decreases).

8. Duel Polarized Radar will give additional information on _____(Dimensions of Target /   Accuracy in precipitable water/ KDP/All)

9. DWR measures velocity based on_____effect.

10. For Longer Range _____(Log/Short) Pulse is used.

11. Klystron is used as an _____ [amplifier/oscillator] in a Doppler Weather Radar.

12. Radar equation for a _____(**Point** / **Extended**) target is applicable for weather radar, and received power has an inverse _____(**fourth** / **second**) power of range of the target separation.

13. Radar range is limited due to_____effect.

14. The linear unit for Radar reflectivity Factor is_____[(a) Z , (b) m^3 , (c) dBZ , (d) m^2 , (e) mm^6/m^3]

15. The weather radar received power is inversely proportional to _____ [square/ fourth power] of the target range.

16. Under super refraction condition, the propagated E-M bends _____.

17. Warm, dry air advection over cooler water surface leads to bending of EM waves below the travelling path and referred as ………………………………..

18. Wave length of C-Band Radar _____ Cm .

Q.2   State with brief reasons whether the following are true or false

1. Attenuation suffered by shorter wavelength radar cannot yield rain rate values precisely.

2. Brightband is an example of "overhang" signature indicative of severe weather like hail, cloudburst.

3. Doppler Weather Radar measures tangential component of velocity of the target.

4. DWR measures the radial velocity of target.

5. In Precipitation Mode: Doppler Weather Radar Scans for 14 elevations starting from 0.5Deg to 13.5deg in short pulse(1µs). Process completes in 5min.

6. Ka band radars are used for cloud studies.

7. Non-polarimetric radars measure only the horizontal dimension of cloud and precipitation particles.

8. Radar backscattering cross-section of a small spherical ice pellet is more than that of an identical sized spherical water-drop.

9. Radar range is directly proportional to fourth power of received power at antenna.

10. Radar reflectivity factor Z is dependent on radar wavelength.

11. RF attenuation is higher in lower frequencies and vice versa.

12. Rotational couplet identification can be affected by azimuth resolution.

13. The height of the radar scanning beam increases with range due to subrefraction.

14. To avoid Doppler Velocity folding Doppler Weather Radar is operated at Staggered PRF

15. When snow is falling with its terminal velocity its outer surface melts to water. Outer film of water around snow reelected as a giant water droplet and give high reflectivity in the Radar is called Bright Band.

Q.3   Answer any one of the following:

1. Briefly discuss which products of DWR are useful for nowcasting and in what way.

2. Bring out the differences between convective and stratiform echoes seen on Doppler weather radar displays.

3. Discuss Doppler Dilemma. What is velocity Folding. What is solution to doppler dilemma.

4. Discuss the VIL product of Doppler Weather Radar with its utilization in identification of different hydrometeors. Also, mention brief note on its limitations and strengths.

5. Hail-storm features that can be observed by Doppler weather radar.

6. Name the important parameters of a tropical cyclonic storm that can be measured/observed through various products of Doppler Weather Radar.

7. Pulse radar operating at 10GHz frequency has an antenna with a gain of 28 dB and a transmitted power of 2kW. If it is desired to detect a target of cross section 12 sq. meter and maximum range of the radar is 8 km, then find the minimum detectable signal in logarithmic scale (i.e. dBm).

8. Radar Equation for point target.

9. What is the Maximum un-ambiguous range and velocity for a single PRF mode of operation of pulsed radar?   An S-Band radar operating at 200PRF with a pulse width of 1microseconds got a return after 2.1milli- seconds of observation. What would be the echo range in kilometer if observed with 500PRF (vel. of light $c=3x10^8$ m/s)?

10. Write a brief on Base products of Doppler Weather Radar. Explain MAX(Z) in detail.

11. Write a short note either on Radar Hydrology or on Weather radar Aviation application. Substantiate with at least two suitable Doppler Weather Radar products.

12. Write a short note on radar precipitation estimates.

13. Write short notes on Duel Polarized RADAR and its advantages over single polarized RADAR.

14. Write short notes on Working principle of Doppler Weather Radar and explain Doppler Delima. How Doppler Delima. Is overcome .

15. Write the radar equation, and explain the importance of any three of the following parameters in detail: a) Pulse Width, b) Wavelength, c) Beam width, d) Complex index of refraction, e) Antenna Gain, f) Target Drop diameter

PART C:- DBM & GIS

Q.1   Fill in the blanks/ Do as directed

1. ------------------- expression is used in Query Processing optimization
2. ----------------------- is the name of RDBMS that IMD, Pune uses for its meteorological data management related climate service activities
3. ----------------- Language helps users to interact with the system in internal model.
4. --------------------------- model is independent of hardware and software
5. A _____is not a data type consists of grid that represents spatial data and associated attributes.
6. A committed transaction process can not be aborted – Say YES or NO
7. A value permanently stored in database is accomplished by a **COMMIT** transaction. Say **YES/NO**
8. By which symbol (Shape) a Weak entity is recognized in Entity Relationship Diagram
9. Cardinality is a measure of relations between entities.   Say **TRUE / FALSE**
10. CliSys used by IMD is an example of file management System. Say **TRUE / FALSE**
11. Creation and modification of conceptual Schema definition is done by which user _____
12. Data Persistence means _____.
13. Data redundancy means _____ and this leads to _____.
14. Data Security and ----------- are the chief advantages of any DBMS
15. Database systems are better alternate to File systems   – Say YES/NO
16. Database systems does not deal with scrambled and large sized data – Say **YES/NO**
17. DBMS is a layered structure in which -------------------- model has low degree of DATA abstraction
18. DCL is acronym for -----------------------
19. ERD stands for -------------------
20. File System is always programme dependent Say – YES/NO

21. File System, generally, is preferable when size and volume of data is LARGE – Say YES/NO

22. File Systems are useful for large sized data sets – Say YES or NO

23. Functional Dependency (FD) is measured by the attributes of entities.   Say TRUE / FALSE

24. Give an example of COMPOSITE ATTRIBUTE in E – R Model

25. Give an example of Data Base Management System

26. Give one example for a derived attribute

27. Give one example of recursive entity

28. Handling of large data sets is easy in File System management Say TRUE / FALSE

29. In _____, relationship between two tables or files can be specified at the time of table creation.

30. In Data Definition language, 'DROP' means _____.

31. In Data Manipulation language, 'INSERTx' means _____.

32. In the SQL statement, Select * from D; means _____. (D is daily surface data table)

33. Interface to access relational database management system is known as _____.

34. Logical level data architecture is also known as _____

35. Physical data refers to the data stored in the_____ memory.

36. Physical level is the _____ level of abstraction.

37. Set of details regarding any observatory such as its geo-location, altitude, environment, etc., used for linking in RDBMS is generally called ----------------------------

38. The _____ contains the shared attributes, while the _____ contains the unique attributes.

39. The attribute's set of all possible values is called _____

40. The Climate Database Management System at IMD Pune Data centre is ----------------

41. The method of choosing the cheapest plan from query processing is called -------------

42. Users who need not be aware of the presence of the database system is called _____

43. When a model is independent of hardware and software interference then the degree of data abstraction is LOW. Say **YES/NO**

44. Which database language enables user to grant authorization _____

45. Which of the following is not an advantage when using a raster data?

a) Simple data structure

b) Geographic accuracy

c) Simulation of data

d) None of the above

46. Which of the following is not an example of GIS data represented as a line?

   a) Storm water drain

   b) Road

   c) Soil Type

   d) All the above

Q.2   State with brief reasons whether the following are true or false

1. A DDL is a language that enables users to access or manipulate data stored in the database.

2. A derived attribute is physically stored within the database.

3. A simple attribute can be subdivided but composite attribute cannot.

4. Data dictionary is the table which contains the information about users data.

5. In Data Manipulation Language, 'DELETE' means remove all records from a table, including all spaces.

6. Metadata is data that describe the properties or characteristics of end-user data, & context of that data.

7. Quality and data reliability of DBMS is known as Data Integrity.

8. The function of Database Administration is creation and modification of conceptual Schema definition.

Q.3   Answer the following:

1. Administrator's responsibilities in a Data Base System

2. Advantages of Data Base Management System

3. Briefly explain the types of Query systems.

4. By what shapes the optional entity and dependent entity are marked?

5. Characteristics of database

6. Data Definition language

7. Data dictionary

8. Data Management System and File System.

9. DBMS Architecture

10. Define DBMS. What are the characteristics of database?

11. Describe any five classifications of GIS functions.

12. Describe any two advantages of WEB GIS.

13. Describe Database Architecture and also Database Language?

14. Describe Entity Relationship Model with proper example?

15. Disadvantages of File System

16. Distinguish between "instance" and "transaction" .

17. Distinguish between Vector and Raster Data.

18. Explain data, metadata, information and knowledge with example.

19. Explain methods of query processing optimization

20. Explain the super-type and sub-type entities

21. Explain with examples the super-type and sub-type entities

22. Give any two basic properties of transactions

23. Give one example each for simple and composite attribute

24. Give one example each for super-type and sub-type entities

25. Give TWO aspects of Concurrency Control Transactions

26. Give two benefits of Materialized Views

27. Give two benefits of primary attributes of an entity

28. Give two merits of DBMS

29. How is symbolically a MULTIVALUED ATTRIBUTE represented? Give one example of this type of attribute

30. Illustrate external and physical schemas with some examples.

31. List the role and responsibilities of a Database Administrator (DBA) in an organization

32. Mention the Meteorological Data obtained by INSAT 3D from both imager & Sounder.

33. Mention two important tasks of a Data Base Administrator.

34. Name any two Query Optimization methods.

35. The importance and methods of query processing optimization

36. The role of a Data Base Administrator in an organisation

37. What are DDL and DML used for?

38. What are the different types of data archived in NDC. Explain File processing system.

39. What are the two states of end result of any transaction

40. What are the two states of outcomes of any transaction?

41. What are the uses of precedence graphs?

42. What do DML and DCL stand for?

43. What is a derived attribute? Give an example.

44. What is file system and Database Management System? Give advantages and disadvantages of both?

45. When are the E – R entities said to be in BINARY RELATIONSHIP?

46. Write a short note on history and evolution of Data Base Management System

47. Write short notes on Cloud Imager of INSAT 3D giving each channel , wavelengths of operation and its resolution and time taken for each scan

48. A particular map shows a scale of 1 cm: 5 km. What would the map distance (in cm) be if the actual distance is 14 km?

    a) 14 cm   b) 6.8 cm   c) 2.4 cm   d) 2.8 cm