

भारत मौसम विज्ञान विभाग  
सूचना संचार एवं उपकरण प्रशिक्षण केंद्र नई दिल्ली  
(विश्व मौसम संगठन का क्षेत्रीय प्रशिक्षण केंद्र नई दिल्ली)  
Advance Training Course in Meteorological Instrumentation  
&  
Information System B-IX

Date: 26.11.2021

Mid-Term Exam

Max. Marks -150  
Time Duration-03 Hrs (1030 – 1330IST)

**RADAR METEOROLOGY**

**Q1 (a) Fill in the blanks (10×1=10)**

1. IMD has installed a number of S-band Radars in entire coastline to observe and track .....
2. If the bright colour patch (dBZ > 40) is seen in maxZ product of any Doppler Weather Radar up to 8 km height, the cloud being observed is most probably .....cloud
3. The most common wavelength used for RF transmission in C-band Radars is ..... Centimeter.
4. Doppler Weather Radars have benefit over the conventional Radars due to its ..... product.
5. .... scattering approximation is used in Weather Radars detecting precipitation
6. If the bending of wave is downward towards the earth more than the anticipated path of the beam for a particular elevation it is called .....
7. ....occurs just below the freezing level when the melting ice particles mimic like very large drops
8. A Radar antenna is generally a parabolic dish antenna that is very sensitive with ..... gain
9. Presentation of longer range echoes in shorter range displays are known as ..... folded echoes
- 10.....is a process of bending of electro-magnetic radiation while travelling between two media of different refractive index.

**Q1.(b) Write True or False with reason (5×2=10)**

1. RADAR is an acronym for Range Detection with Radio
2. S-band radar are economic than C-band radar.
3. Range Height Indicator product (RHI) is in which reflectivity, radial velocity or spectral width is presented on a conical surface of a constant elevation as an output image
4. Meteorological targets like clouds are Distributed targets, with the billions of raindrops that contribute to the returned energy
5. The velocity component of a target relative to the radar beam is known as the "Spectral Width"-

## SATELLITE

### Q2.(a) Multiple Choice Questions with answers (10X1=10)

**1. A geosynchronous satellite**

- a. has the same period as that of the Earth
- b. has a circular orbit
- c. rotates in the equatorial plane
- d. has all of the above

**2. Repeaters inside communication satellites are known as .....**

- a. Transceivers
- b. Transponders
- c. Transducers
- d. TWT

**3. .... law states that the path followed by the satellite around the primary will be an ellipse.**

- a. Newton's 1st law
- b. Kepler's first law
- c. Kepler's second law
- d. Kepler's third law

**4. Which law states that for equal time intervals, the satellite will sweep out equal areas in its orbital plane, focused at the barycenter.**

- a. Newton's 1st law
- b. Kepler's first law
- c. Kepler's second law
- d. Kepler's third law

**5. A communication satellite is a repeater between ..... and .....**

- a. a transmitting station and a receiving station
- b. a transmitting station and many receiving station
- c. many transmitting station and many receiving station
- d. none

**6. Ground wave propagation is suitable for frequencies up to.....**

- a. 10 MHz
- b. 30 MHz
- c. 30 GHz
- d. none

**7. Eccentricity of a circular orbit is.....**

- a. 1
- b. 0.75

- c. 0
- d. 0.5

8. As the height of a satellite orbit gets lower, the speed of the satellite .....

- a. Increases
- b. Decreases
- c. Remains the same
- d. None of the above

9. MEO operates in the frequency range of .....

- A. 2 MHz and above
- b. 20 MHz and above
- c. 2 GHz and above
- d. None of the above

10. A satellite link uses different frequencies for receiving and transmitting in order to .....

- a. avoid interference from terrestrial microwave links
- b. avoid interference between its powerful transmitted signal and weak incoming signal
- c. minimize free-space losses
- d. maximize antenna gain

**Q2(b) Fill in the blanks (5×1=5)**

- I. In Satellite communication ..... waves are used as carrier signals.
- II. The maximum hop or the station distance is limited to ..... km only in ground wave propagation and sky wave propagation
- III. Repeater works as .....
- IV. The process of satellite communication begins at an ..... station
- V. The length of **Semi-major axis (a)** defines the size of satellite's.....

**Q2(c) Give the answer True/False (any Five) (5X1=5)**

- I. It is impossible to discriminate one satellite from other satellites based on the values of orbital elements.
- II. Eccentricity indicates the deviation of the orbit's shape from a perfect circle.
- III. Satellite doesn't deviate from its orbit and moves with certain velocity in that orbit, when Centripetal force is half of the Centrifugal forces.
- IV. Orbital velocity doesn't depend on the distance from satellite to center of the Earth
- V. Indian National Satellite System (INSAT) was commissioned in 1971
- VI. Aryabhata, launched in 1975, was India's first satellite.

## Earth Station and GNSS

### **Q3 (a) Short Question (10X1=10)**

- I. What is GNSS?
- II. Which type of code is transmitted by GNSS satellites?
- III. In Troposphere, Refractivity associated with?
- IV. What is Atmospheric delay?
- V. Which type of modulation and encoding technique is used in Imager and Sounder payloads of INSAT- 3D/3DR satellite to receive the signals.
- VI. What is the DRT payload of the INSAT-3D satellite?
- VII. What is the data rate of Imager and Sounder payload of INSAT-3D/3DR satellite to receive the signal?
- VIII. What is a beacon tracking Receiver?
- IX. Why sometimes need to track the INSAT-3D/3DR satellites.
- X. Which type of LNA is used to receive the signal from INSAT-3D/3DR satellite.

### **Q3 (b) Fill in the blanks with a suitable answer (any Five) (5X1=5)**

- (a) \_\_\_ meters diameter antenna is used to receive the data from INSAT-3D/3DR satellite.
- (b) \_\_\_&\_\_\_ encoding technique used in imager and sounder and \_\_\_& \_\_\_ data rate is used to receive the signal of Imager and Sounder of INSAT-3D/3DR satellite.
- (c) \_\_\_&\_\_\_ modulation technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite to receive the signals.
- (d) DRT payload of INSAT-3D satellite is having uplink frequency \_\_\_ and downlink frequency\_\_\_.
- (e) GPS satellites Carries Atomic Clock on board and transmit two low power radio signals, L1=---and L2 =-----.
- (f) Multipath effects are removed by \_\_\_\_\_Antennae.

### **Q3 (c) Give the answer True/False (any Five) (5X1=5)**

- I. The Antenna Control Unit (ACU) is used for steering the antenna either manually or automatically.
- II. In the present ground receiving an operational set of INSAT-3D/3DR is using Low Noise Amplifier (LNA) in extended C-Band.
- III. Down converter converts the radio frequency (RF) to Intermediate Frequency (IF).
- IV. The serial data streams for Imager and Sounder received from Bit Synchronizer are fed to the DACQ Card/Frame synchronization through BNC to 5 Pin D connector.

V. INSAT-3D/3DR is a polar satellite.

## NETWORKING

### **Q4 (a) Fill in the blanks with a suitable answer (any Five) (5X1=5)**

- i. LAN stands for \_\_\_\_\_.
- ii. Wi- Fi stands for \_\_\_\_\_.
- iii. MAN stands for \_\_\_\_\_.
- iv. WAN stands for \_\_\_\_\_.
- v. Switch works on \_\_\_\_\_ Layer.
- vi. Speed of Cat 6 cable is \_\_\_\_\_.

### **Q4 (b) Short Question (10X1=10)**

- I. What is switch?
- II. What is SAN Switch?
- III. What is the speed and frequency of CAT 6 7 CAT 7 cable?
- IV. Explain MAN & WAN?
- V. What is Modem?
- VI. Define different types of cat cables?
- VII. What is flow control in modem function?
- VIII. Explain serial and parallel port?
- IX. Define Host, Hub?
- X. Define Router?

### **Q4 (C) Give the answer True/False (5X1=5)**

- I. Router is a layer 2 device.
- II. Speed of Cat 7 cable is 1000Mbps.
- III. Cat 1 carries only voice.
- IV. San stands for switch area network.
- V. Transfer rate of Cat 6 and Cat 7 cable is same

## AWS & ARG

### Q5 (a) Short question/ MCQ of 1 marks each( 10X1=10)

1. IMD's Automatic weather station works on power supply
  - a) 12 VSMF Battery
  - b) 230 V AC
  - c) 24 V DC
  - d) All of the above.
  
2. The mode of communication in IMD AWS and ARG network are
  - a) GPRS
  - b) Satellite
  - c) Both GPRS and satellite
  - d) All of the above**
  
3. The pressure sensors used in AWS give
  - a) Station level pressure
  - b) Mean Sea level pressure
  - c) Height of the Stations
  - d) None of these
  
4. The Datum value used in Datalogger ( satellite based AWS)to calculate
  - a) Mean Sea level pressure
  - b) Height of the Stations
  - c) Station level pressure
  - d) None of these
  
5. The sensing element used for temperature measurement in Temperature and Humidity sensors of AWS is
  - a) PT 100
  - b) Thermocouple
  - c) Photodiode
  - d) None of these
  
6. The wind sensors should be installed at fixed height in Agro AWS and this height should be

- a) 2 m
  - b) 3 m
  - c) 30 m
  - d) 10 m
7. The sunshine duration measured in Agro AWS should be
- a) Automatically
  - b) Manually
  - c) Both automatically and manually
  - d) None of these.
8. The Automatic Raingauge Stations consists of two sensors only
- a) Temperature and Humidity sensors and soil moisture sensors
  - b) Rainfall sensors and wind sensors
  - c) Pressure sensor and rainfall sensors
  - d) Rainfall sensors and Temperature and Humidity sensors
9. The GPRS based AWS in IMD network transmits data at an interval of
- a) 15 minutes
  - b) 30 minutes
  - c) 1 hour
  - d) 24 hour
10. The satellite based AWS in IMD network transmits data at an interval of
- a) 15 minutes
  - b) 30 minutes
  - c) 1 hour
  - d) 24 hour
  - e)

**Q5(b) Fill in the blanks (5×1=5)**

1. Tipping Bucket Rain Guage sensor used for the measurement of \_\_\_\_\_ in AWS
2. Satellite based AWS has one way communication where as GPRS based AWS has \_\_\_\_\_ communication.

3. The standard mast height used with automatic weather stations in IMD is \_\_\_\_
4. The pressure sensor used in AWS for measure of \_\_\_\_\_.
5. The SMF battery used in AWS is charged by \_\_\_\_\_ and \_\_\_\_\_

**Q5 (C) Give the answer True/False (5X1=5)**

1. Conventional Thermometer can be used for the AWS.
2. Solar panel is mounted on Mast of AWS facing north.
3. Since tipping bucket rain gauges are automatic there is no need for maintenance.
4. Soil moisture sensors is used in Agro AWS.
5. Satellite based AWS works on TDMA mode of communication.

**Web Designing**

**Q6(a) Give the Answer following MCQ (5×1=5)**

1. Correct HTML tag to describe HTML document?

1. <body></body>
2. <head></head>
3. <h1></h1>
4. <html></html>

2. Who invented Java Programming?

1. Guido van Rossum
2. James Gosling
3. Dennis Ritchie
4. Bjarne Stroustrup

3. PHP is acronym for :

1. Hypertext Preprocessor
2. Pretext Hypertext Preprocessor
3. Personal Home Processor
4. None of the above

4. GIS captures and analyses \_\_\_\_ data.

1. Spatial
2. Geographic
3. Both a and b



4. None of the above
5. What does XML stand for?
  - a) eXtra Modern Link
  - b) eXtensible Markup Language
  - c) Example Markup Language
  - d) X-Markup Language

**Q6(b) Fill in the blanks (any Five) (5×1=5)**

1. HTML stands for .....
2. JVM stands for.....
3. PHP is .....server side scripting language.
4. GIS stand for.....
5. XML is a markup language much like.....
6. CMS is stand for.....

**Q6(C) Give the answer True/False (any Five) (5X1=5)**

1. HTML is used for development of web pages?
2. Java is platform dependent?
3. PHP doesn't support database?
4. GIS handles both raster and vector data?
5. All XML elements must have a closing tag?
6. Drupal is used to create Content Management System?

**OPTICAL FIBRE COMMUNICATION**

**Q7(a) Fill in the blanks (any Five) (5×1=5)**

1. Channel Used in Optical Fibre Communications are- \_\_\_\_\_.
2. Undersea Optical Fibre Cables are also called \_\_\_\_\_.
3. Main principle of Optical Fibre communication is \_\_\_\_\_ Law.
4. Full form of BTS in Mobile Communication system is \_\_\_\_\_.
5. Full form of MSC in Mobile Communication system is \_\_\_\_\_.
6. Full form of LTE in relation to 4G Technology is \_\_\_\_\_.

**Q7(b) Give the answer True/False (5X1=5)**

- (a)Radioactive losses in Optical Fibres occur due to bending of Optical fiber cables. (True/ False).
- (b)Absorption and Scattering losses in Optical fibre are due to impurities in material of fiber. (True/ False).

(c) Full form of GSM is Global System for Mobile Telecommunication. (True/ False).

(d) Full form of GPRS is General Packet Radio Switching. (True/ False).

(e) Advantages of Optical Fibers are- (Tick which ever are applicable)

- i. Can carry much more information
- ii. Much higher data rates
- iii. Immune to electromagnetic noise - Very less chances of cross talk between nearby cables
- iv. Cost of Network equipment is high
- v. Only I,ii,iii

### Q7(C) Give the Answer following MCQ (5×1=5)

(a) Which type of Optical Fibres can transmit multiple signals- Single Mode or Multi Mode?

(b) Which type of Optical Fibres are thicker - Single Mode or Multi Mode?

(c) In which type of Optical Fibres, Refractive Index is highest at the centre of the fibre and decreases gradually when moving away from the centre of fibre- Step Index Mode or Graded Index Mode?

(d) Arrange in order of lowest speed to highest speed – 1G, 2G, 3G, 4G.

(e) Some prominent characteristics of 2G communication are – (Tick whichever is applicable)

- a. Data speeds up to 64 kbps
- b. Text and multimedia messaging possible
- c. Better quality than 1G
- d. All of the Above

### UPPER AIR INSTRUMENTS

#### Q 8(a). Choose the correct alternative for all questions (10×1=10)

(1) Which is not a scheduled time of observation for upper air balloon ascents?

- i) 0530 IST ii) 0830 IST iii) 1730 IST

(2) The GPS based radiosounding system operates on the following frequency:

- i) 403 MHz ii) 800 MHz iii) 1200 MHz

(3) The Intermediate frequency (IF) of RSGE system is.....MHz.

- i) 10.7 MHz ii) 33 MHz iii) 68 MHz

(4) The antenna used in IMS-1500 is of .....Type.

- i) Co-axial Collinear ii) Dish type iii) Helical

(5) Which of the following is not a parameter observed in radio wind observation.

- i) Temperature ii) Wind Direction iii) Wind speed

(6) IMD has a network of ..... Stations in its RS/RW upper air network.

- i) 56 ii) 62 iii) 99

(7) The Temperature sensor in GPS based radio sounding is of

- i) Bead type ii) Digital IC iii) capacitive type

(8) Which of the following upper air observing system is fully automatic in operation?

- i) SAMEER make radiotheodolite ii) GPS based iii) Optical based

(9) Which of the IMD station is part of GUAN network?

- i) Chennai ii) Portblair iii) Srinagar

(10) The observation of upper winds in radio sounding are based on.

- i) Drift of balloon in air ii) Atmospheric pressure iii) Atmospheric humidity

**Q8(b). State True or False with Justification. 2 Marks each (5×2=10)**

1. SODAR system works on Microwave Frequencies.
  2. GPS based systems are semi-automatic systems.
  3. RSGE sounding systems are used as stand by equipment at each of the RS/RW station.
  4. Radiotheodolite systems use super-heterodyne type of Receivers,
  5. Tracking of pilot balloon (PB) in optical theodolites is a fully automatic observation.
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