

**भारत मौसम विज्ञान विभाग**  
**सूचना संचार व उपकरण प्रशिक्षण केंद्र, नई दिल्ली**  
**(विश्व मौसम विज्ञान संगठन का क्षेत्रीय प्रशिक्षण केंद्र )**  
**INDIA METEOROLOGICAL DEPARTMENT**  
**INFORMATION COMMUNICATION & INSTRUMENT TRAINING CENTRE, NEW DELHI**  
**ADVANCED TRAINING IN METEOROLOGICAL INSTRUMENTATION & INFORMATION SYSTEM**

**BATCH – XI**

**MID TERM EXAMINATION**

**Date – 05.12.2022**

**Time: 03:00 Hours (10:30AM – 01:30PM)**

**Total Marks: 150 Marks**

**Introduction to Radar Meteorology**

**1. (A) Fill in the blanks. - (Any 10)**

**(1x10=10 Marks)**

- i. One can utilize \_\_\_\_\_ product to find wind veering or backing near the Radar station.
- ii. If the bright color 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.
- iii. The atmospheric attenuation \_\_\_\_\_ as the Radar frequency of operation increases.
- iv. Doppler Weather Radars have benefit over the conventional Radars due to it's \_\_\_\_\_ product.
- v. \_\_\_\_\_ scattering approximation is used in Weather Radars detecting precipitation.
- vi. 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 \_\_\_\_\_
- vii. \_\_\_\_\_ occurs just below the freezing level when the melting ice particles mimic like very large drops.
- viii. If a pulse width of one (1)  $\mu$  sec is used in pulsed Radar, the distance from Radar where we starts to receive/ process the echo would be \_\_\_\_\_ Meter.
- ix. A Radar antenna is generally a parabolic dish antenna that is very sensitive with \_\_\_\_\_ gain.
- x. Presentation of longer range echoes in shorter range displays are known as \_\_\_\_\_ folded echoes.
- xi. \_\_\_\_\_ is a process of bending of electro-magnetic radiation while travelling between two media of different refractive index.
- xii. Unambiguous range \_\_\_\_\_ with increase in PRF.

**(B) Write True or False with brief explanation. - (Any 5)**

**(2 x 5 = 10 Marks)**

- i. S-band Radar are economic than C-band Radar.
- ii. 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.
- iii. The velocity component of a target relative to the radar beam is known as the "Spectral Width".
- iv. VHF radars are used for observing mesosphere, stratosphere and troposphere.
- v. Magnetron transmitters are used in DWRs particularly to achieve high coherence between the transmitted and received pulses.
- vi. Low PRF reduces the unambiguous velocity.
- vii. Bounded weak echo region is due to updraft in Thunderstorm.

## Introduction to Satellite Technique

### 2. (A) Fill in the blanks. - (Any 10)

(1x10=10 Marks)

- i. \_\_\_\_\_ Meters diameter antenna is used to receive the data from INSAT-3D/3DR satellite.
- ii. INSAT-3D & 3DR is a geostationary satellite and located at \_\_\_\_\_ & \_\_\_\_\_ longitude.
- iii. Imager & Sounder payloads of INSAT-3D/3DR satellite is having \_\_\_\_\_ frequency & \_\_\_\_\_ frequency to receive the data.
- iv. \_\_\_\_\_ & \_\_\_\_\_ are encoding techniques used in imager and sounder.
- v. \_\_\_\_\_ & \_\_\_\_\_ data rate is used to receive the signal of Imager and Sounder of INSAT-3D/3DR satellite.
- vi. \_\_\_\_\_ & \_\_\_\_\_ modulation technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite to receive the signals.
- vii. DRT payload of INSAT-3D satellite is having uplink frequency \_\_\_\_\_ and downlink frequency \_\_\_\_\_.
- viii. GPS satellites Carries Atomic Clock on board and transmit two low power radio signals, L1=\_\_\_\_\_ and L2 =\_\_\_\_\_.
- ix. Multipath effects are removed by \_\_\_\_\_ Antennae.
- x. \_\_\_\_\_ Hrs. Orbital period of GPS Satellites are in orbit around the earth.
- xi. Weighted Mean temperature of the vertical atmosphere  $T_m=55.8+0.77^*$  \_\_\_\_\_.
- xii. Tropospheric delay = Hydrostatic Delay + \_\_\_\_\_.

### (B). Short Answer type Questions. - (Any 5)

(2 x 5=10 Marks)

- i. Write a brief note on GNSS?
- ii. Which type of code is transmitted by GNSS satellites?
- iii. In Troposphere, Refractivity associated with?
- iv. Write the formula to calculate Atmospheric delay?
- v. What is the DRT payload of the INSAT-3D satellite?
- vi. Why sometimes we need to track the INSAT-3D/3DR satellites?
- vii. What is use of LNA and where is it mounted in receiving antenna of the earth receiving station, explain the need for its mounting location?

## Concept of AWS & ARG

### 3. (A) Fill in the blanks. - (Any 10)

(1x10=10 Marks)

- i. The Temperature sensor used has \_\_\_\_\_ output in AWS/ARG.
- ii. GPS receiver and its antenna is used in satellite based AWS for \_\_\_\_\_.
- iii. Pressure sensor is necessary for measurement of \_\_\_\_\_ in AWS.
- iv. The maximum number of AWS that can be communicated through GPRS technology is \_\_\_\_\_.
- v. Name sensors having digital output used in existing AWS of IMD are \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_.
- vi. The standard measurement height for temperature and relative humidity sensor is \_\_\_\_\_.
- vii. The rainfall sensor-tipping bucket is placed in an open area as far as possible at a minimum distance of \_\_\_\_\_ times the height of any obstruction.
- viii. Sunshine duration is defined by WMO as the time during which the direct solar radiation exceeds the level of \_\_\_\_\_ W/m<sup>2</sup>.
- ix. Antenna used for satellite communication for uplink is \_\_\_\_\_.
- x. In AWS/ARG for satellite communication the angle at which the antenna has to be oriented depends upon \_\_\_\_\_ and \_\_\_\_\_.
- xi. Global solar radiation sensor is installed at a height of \_\_\_\_\_.
- xii. The output voltage of temperature and humidity sensor will be in between \_\_\_\_\_.

**(B) Write True or False with brief explanation. - (Any 5)**

**(2 x 5 = 10 Marks)**

- i. Ultrasonic wind sensor requires regular maintenance.
- ii. The resolution of TBRG sensor used in IMD's AWS and ARG is 0.1 mm.
- iii. Agro AWS have soil sensors used for measurement soil temperature and soil moisture.
- iv. The SMF battery of AWS /ARG / Agro AWS is charged by Electrical charger.
- v. The sensing element of Temperature in AT/RH sensors is Pt 100.
- vi. TBRG sensor is an analog sensor.
- vii. In AWS wind sensor is keep at a height of 3m

**Concept of Optical Fiber & Wireless Communication**

**4. (A) Fill in the blanks. - (Any 6)**

**(1x6=6 Marks)**

- i. Undersea Optical Fiber Cables are also called \_\_\_\_\_.
- ii. Main principle of Optical Fiber communication is \_\_\_\_\_ Law.
- iii. Light propagates in Optical fiber due to \_\_\_\_\_
  - a) Scattering.
  - b) Dispersion
  - c) Refraction.
  - d) Total Internal Refraction.
- iv. First Generation Mobile communication technology uses (Analog/ Digital) \_\_\_\_\_ Communication.
- v. 1G & 2G Mobile technologies were optimized for communications. (Voice / Data)
- vi. Full form of LTE in relation to 4G Technology is \_\_\_\_\_.
- vii. LTE uses \_\_\_\_\_ technique to achieve high data rates.
- viii. Quantization is used in which Modulation technique
  - a) Pulse Code Modulation.
  - b) Phase shift Keying
  - c) Amplitude Shift Keying
  - d) All of Above

**(B) Write True or False with brief explanation. - (Any 3)**

**(2 x 3 = 6 Marks)**

- i. Full form of GSM is Global System for Mobile Telecommunication.
- ii. Full form of GPRS is Generic Packet Radio Switching.
- iii. Single mode optical fibers are thicker
- iv. Radiative losses in Optical Fibers occur due to bending of Optical fiber cables.
- v. Absorption and Scattering losses in Optical fiber are due to impurities in material of fiber.

**(C). Short Answer type Questions. - (Any 1)**

**(1 x 3=3 Marks)**

- i. Drawn a typical Digital Communication system with block diagram.
- ii. Write Shannon-Hartley Equation and explain its terms.

**Introduction to Satellite Communication**

**5. (A) Fill in the blanks. - (Any 10)**

**(1x10=10 Marks)**

- i. As the height of a satellite orbit increases, the speed of the satellite\_\_\_\_\_.
- ii. Transmission delay is least in \_\_\_\_\_ Satellite communication system. (LEO/GEO/MEO)
- iii. Orbital slots are allocated to the Satellite operator by \_\_\_\_\_.
- iv. The value of eccentricity of asatellite orbit lies between \_\_\_\_\_ and\_\_\_\_\_.
- v. Kepler's third law states that, the square of the periodic time of an elliptical orbit is proportional to the cube of its \_\_\_\_\_axis.
- vi. The point where the orbit crosses the equatorial plane going from south to north is known as \_\_\_\_\_.

- vii. Eccentricity of a \_\_\_\_\_ Orbit is zero.
- viii. The transmitter-receiver combination in the satellite is known as a \_\_\_\_\_.
- ix. Propagation delay of satellite systems is \_\_\_\_\_ than that of conventional terrestrial systems for communication. (more/less)
- x. Transmission cost is independent of coverage area in \_\_\_\_\_. (Satellite communication / conventional terrestrial systems)
- xi. \_\_\_\_\_ gives the average value of the angular position of the satellite with reference to perigee (mean anomaly/inclination/argument of perigee).
- xii. If both perigee and ascending node are existing at same point, then the argument of perigee will be \_\_\_\_\_ degrees.

**(B) Write True or False with brief explanation. - (Any 5)**

**(2 x 5 = 10 Marks)**

- i. If the satellite is placed in lower orbit then the camera onboard the satellite gives better resolution.
- ii. GEO satellites are good for polar coverage.
- iii. Transmissions in certain frequencies such as S/C bands can experience interference from heavy rain or snow.
- iv. Large size of antenna is required for X band communication as compared to Ka band for a given beam width.
- v. Radio jammer works by the transmission of radio signals that disrupt communications by increasing the signal-to-noise ratio.
- vi. Main external perturbations come from Sun and Moon.
- vii. Three LEO satellites are required to cover entire earth.

**Introduction to Concept of Networking**

**6. (A) Fill in the blanks. - (Any 10)**

**(1x10=10 Marks)**

- 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 \_\_\_\_\_.
- vii. Cat 1 carry only \_\_\_\_\_.
- viii. Router works on \_\_\_\_\_ Layer.
- ix. IPv6 allows \_\_\_\_\_ bits for an Internet Protocol address.
- x. \_\_\_\_\_ or \_\_\_\_\_ are the organizations responsible for registering IP ranges and assigning them to organizations, such as Internet Service Providers (ISPs).
- xi. (HSRP) stands for \_\_\_\_\_.
- xii. (DHCP) stand for \_\_\_\_\_.

**(B) Write True or False with brief explanation. - (Any 5)**

**(2 x 5 = 10 Marks)**

- 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.
- vi. All Cat cables have same frequency.
- vii. MAN is larger than WAN.

## Introduction to web designing

### 7. (A) Multiple Type Questions (MCQs). - (Any 6)

(1x6=6 Marks)

- i. What is Internet Explorer?
  - a. An Icon
  - b. A File Manager
  - c. A Browser
  - d. The Internet
- ii. PHP is acronym for:
  - a. Hypertext Preprocessor
  - b. Pretext Hypertext Preprocessor
  - c. Personal Home Processor
  - d. None of the above
- iii. What is the purpose of using CMS?
  - a. To make regular web designing easy.
  - b. To reach out to audience with low coding knowledge
  - c. Because its very user friendly
  - d. All of the above
- iv. HTML stands for \_\_\_\_\_.
- v. PHP is \_\_\_\_\_ server side scripting language.
- vi. What does XML stand for?
  - a. eXtra Modern Link
  - b. eXtensible Markup Language
  - c. Example Markup Language
  - d. X-Markup Language
- vii. Which tag is used to display the numbered list?
  - a. <OL></OL>
  - b. <DL></DL>
  - c. <UL></UL>
  - d. <LI></LI>
- viii. What do I need to get onto the Internet?
  - a. Computer
  - b. Modem
  - c. Browser
  - d. All of the above

### (B) Write True or False with brief explanation. - (Any 3)

(2 x 3 = 6 Marks)

- i. HTML is used for development of web pages? True/False. Explain briefly
- ii. PHP doesn't support database? True/False. Explain briefly.
- iii. What is web server?
- iv. What is web designing?
- v. Can you give a background color in HTML? Give any example.

### (C). Short Answer type Questions. - (Any 1)

(1 x 3=3 Marks)

- i. What is a CSS file and what are some benefits of using it??
- ii. What is PHP? Describe briefly.

## Introduction to RS/RW/ Upper Air

### 8. (A) Multiple Type Questions (MCQs). - (Any 10)

(1x10=10 Marks)

- i. Which is not a scheduled time of observation for upper air balloon ascents?
  - a) 0530 IST
  - b) 0830 IST
  - c) 1730 IST

- ii. The GPS based radiosounding system operates on the following frequency:
  - a) 403 MHz
  - b) 800 MHz
  - c) 1200 MHz
- iii. The Intermediate frequency (IF) of RSGE system is \_\_\_\_\_ MHz.
  - a) 10.7 MHz
  - b) 33 MHz
  - c) 68 MHz
- iv. The antenna used in IMS-1500 is of \_\_\_\_\_ Type.
  - a) Co-axial Collinear
  - b) parabolic dish type
  - c) Helical
- v. Which of the following is not a parameter observed in radiowind observation.
  - a) Temperature
  - b) Wind Direction
  - c) Wind speed
- vi. IMD has a network of \_\_\_\_\_ Stations in its RS/RW upper air network.
  - a) 56
  - b) 62
  - c) 99
- vii. The Temperature sensor in GPS based radiosounding is of.
  - a) Bead type
  - b) Digital IC
  - c) Capacitive type
- viii. Which of the following upper air observing system is fully automatic in operation?
  - a) SAMEER make radiotheodolite
  - b) GPS based
  - c) Optical based
- ix. Which of the IMD station is part of GUAN network?
  - a) Chennai
  - b) Port Blair
  - c) Srinagar
- x. The observation of upper winds in radiosounding is based on.
  - a) Drift of balloon in air
  - b) Atmospheric pressure
  - c) Atmospheric humidity
- xi. The carrier frequency range of SAMEER make system is
  - a) (1669.57-1700) Mhz
  - b) (395-406) Mhz
  - c) (390-410) Mhz
- xii. The tracking technique used in IMS-1500 system is
  - a) Lobe switching
  - b) Helical
  - c) conical scanning

**(B) Write True or False with brief explanation. - (Any 5)**

**(2 x 5 = 10 Marks)**

- i. SODAR system works on Microwave Frequencies.
  - ii. GPS based systems are semi-automatic systems.
  - iii. Radio theodolite systems use super-heterodyne type of Receivers,
  - iv. Tracking of pilot balloon (PB) in optical theodolites is a fully automatic observation.
  - v. Observation of Pressure in radio sounding systems is based on the drift of the balloon in the air.
  - vi. Pressure sensor cannot be used in GPS based radiosonde.
  - vii. A band pass filter is provided in the transmitter circuit of radiosonde.
-