

**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 (Batch No – XII)**

**Final Exam: Paper –II**

**Date: 30.08.2023**

**Max. Marks -100**

**Time:- 10:30-13:30**

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**Operation & Maintenance of various weather radars**

**1. (A) Fill in the blanks: (Answer any 4)**

**(1 × 4 = 4 Marks)**

- i. Maintenance and calibration of Doppler Weather Radars are essential to ensure the accuracy of \_\_\_\_\_ and \_\_\_\_\_.
- ii. Beam widening at long ranges is a source of error in radar measurements caused by the \_\_\_\_\_ of the radar beam.
- iii. One limitation of radar measurements is the \_\_\_\_\_ of radar waves, which can affect the accuracy of data, especially at longer distances.
- iv. Dual Polarization Products enhance radar data by providing information about \_\_\_\_\_ and \_\_\_\_\_ properties of precipitation.
- v. Aviation Products from Doppler Weather Radars help in identifying \_\_\_\_\_ and providing real-time weather information to air traffic control.

**1. (B) Indicate True or False with justification: (Answer any 3)**

**(2 × 3 = 6 Marks)**

- i. Attenuation of radar waves has no significant impact on radar measurements, regardless of the distance.
- ii. The Bright Band phenomenon occurs when radar beams are focused too narrowly.
- iii. Weather radar is primarily used for long-term climate modeling and historical weather analysis.
- iv. Weather radar beamwidth remains constant regardless of the radar's operating frequency.

**RADAR Meteorology**

**2. (A) Fill in the blanks: (Answer any 10)**

**(1 × 10 = 10 Marks)**

- i. In weather radar, the \_\_\_\_\_ of the radar beam can affect the accuracy and coverage of observations.
- ii. The presence of a " \_\_\_\_\_ " on radar imagery indicates the melting layer in a precipitation event.
- iii. The use of \_\_\_\_\_ radar systems helps mitigate attenuation issues in heavy rainfall conditions.
- iv. Doppler radar data is essential for tracking the development and movement of \_\_\_\_\_ within storms.
- v. In radar meteorology, the term \_\_\_\_\_ refers to the intensity of radar signals reflected by precipitation targets.

- vi. Doppler radar is capable of measuring the \_\_\_\_\_ of precipitation particles, providing insights into wind patterns within storms.
- vii. \_\_\_\_\_ happens when radar measures the speed of a target incorrectly due to exceeding the radar's Nyquist capabilities.
- viii. Super refraction occurs when the radar beam is bent more than usual, often caused by a sharp increase in \_\_\_\_\_.
- ix. Range folding happens when radar echoes from distant targets are incorrectly displayed on a \_\_\_\_\_ radar screen.
- x. Dual PRF is used in radar systems to mitigate the issue of \_\_\_\_\_ and improve the accuracy of velocity measurements.
- xi. ZR (Z-R) relation is an empirical formula used in meteorology to estimate \_\_\_\_\_ based on the \_\_\_\_\_.

**2. (B) Indicate True or False with justification: (Answer any 5)**

**(2 × 5 = 10 Marks)**

- i. 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.
- ii. Meteorological targets like clouds are Distributed targets, with the billions of raindrops that contribute to the returned energy .
- 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. High PRF increases the unambiguous range.

### **Radar Technology**

**3. (A) Fill in the blanks: (Answer any 4)**

**(1 × 4 = 4 Marks)**

- i. Speed of light in a medium is  $2.0 \times 10^8$  meters per second, while the speed of light in a vacuum is 299,792,458 meters per second, the refractive index of medium is \_\_\_\_\_.
- ii. The process in a Klystron tube where electrons come together and change their velocity is referred to as \_\_\_\_\_.
- iii. \_\_\_\_\_ represents the relationship between the power transmitted in a particular direction and a designated reference point.
- iv. Circular polarization happens when the electromagnetic field of the wave maintains a \_\_\_\_\_ magnitude while rotating at a steady pace in a plane perpendicular to the wave's direction.
- v. In waveguides, the two modes of propagation are \_\_\_\_\_ & \_\_\_\_\_.

**3. (B) Please Explain in brief: (Answer any 3)**

**(2 × 3 = 6 Marks)**

- i. Explain the phenomena of Ducting.
- ii. What is the Drift space in Klystron.
- iii. What is the key advantage of phased array radars over traditional mechanically-scanned radars?
- iv. What are TEM waves?

## Meteorological Communication Systems

### 4. (A) Fill in the blanks: (Answer any 10)

(1 × 10 = 10 Marks)

- i. Frequency used in wireless communication are \_\_\_\_\_.
- ii. POE stands for \_\_\_\_\_.
- iii. VPN stands for \_\_\_\_\_.
- iv. VSAT stands for \_\_\_\_\_.
- v. Frequency band used for VSAT communications are \_\_\_\_\_.
- vi. AMSS stands for \_\_\_\_\_.
- vii. AFTN stands for \_\_\_\_\_.
- viii. GTS stands for \_\_\_\_\_.
- ix. MPLS stands \_\_\_\_\_.
- x. The priority indicator for meteorological message in AFTN message is \_\_\_\_\_.
- xi. Regional OPMET data bank for India region is \_\_\_\_\_.
- xii. For remote locations and during natural calamities \_\_\_\_\_ is the best method of communication.

### 4. (B) Indicate True or False with justification: (Answer any 5)

(2 × 5 = 10 Marks)

- i. There are 5 AMSS in IMD.
- ii. Wireless communication is better than landline communication.
- iii. Lower baud rate is preferred for transmitting serial data over longer distances.
- iv. Bandwidth is share among different agencies in lease line circuit.
- v. AFTN network is used for doing video conferencing.
- vi. What are the three major components of VSAT communication?
- vii. Write three advantages of lease line circuits over broadband.

## Introduction to HTML and PHP, GIS Platform and Development

### 5. (A) Fill in the blanks: (Answer any 10)

(1 × 10 = 10 Marks)

- i. HTML is a markup language used for creating \_\_\_\_\_ web pages.
- ii. Java is a popular \_\_\_\_\_-oriented programming language.
- iii. GIS stands for \_\_\_\_\_, used for spatial data analysis.
- iv. CMS stands for Content Management System, used for \_\_\_\_\_.
- v. Ingesting data into a database means \_\_\_\_\_ data into the database for storage and retrieval.
- vi. \_\_\_\_\_ is a technology that allows the integration of maps and geographic data into applications.
- vii. \_\_\_\_\_ is a widely used scripting language for web development.
- viii. XML uses \_\_\_\_\_ to structure data.
- ix. Data \_\_\_\_\_ is crucial for ensuring data accuracy and reliability in a database.
- x. XML (eXtensible Markup Language) is a versatile format used for storing and transporting data in a \_\_\_\_\_ and \_\_\_\_\_ way.
- xi. HTML, Java, and PHP are commonly used in web development, with HTML for \_\_\_\_\_, Java for \_\_\_\_\_, and PHP for \_\_\_\_\_.

**5. (B) Indicate True or false with justification:(Answer any 5)**

**(2 × 5 = 10 Marks)**

- i. JavaScript is a programming language primarily used for styling web pages.
- ii. JavaScript is a subset of Java, sharing many similarities in syntax and functionality.
- iii. XML tags are case-insensitive, meaning that <tag> and <Tag> are treated as the same tag.
- iv. Java is a strictly interpreted programming language.
- v. HTML is responsible for defining the visual styling of web pages, such as fonts, colors, and layouts.
- vi. PHP is primarily used for front-end web development, focusing on user interface design.

**Linux and server Management**

**6. (A) Fill in the blanks: (Answer any 10)**

**(1 × 10 = 10 Marks)**

- i. In Linux, the command to list the contents of a directory is \_\_\_\_\_.
- ii. A Linux server typically uses \_\_\_\_\_ to manage remote access securely.
- iii. \_\_\_\_\_ is a process of limiting access to resources on a server based on user permissions.
- iv. The configuration file for the Apache web server is usually named \_\_\_\_\_.
- v. To display real-time system statistics in Linux, you can use the \_\_\_\_\_ command.
- vi. \_\_\_\_\_ is a package manager commonly used in Debian-based Linux distributions.
- vii. In Linux, the command to create a new directory is \_\_\_\_\_.
- viii. The \_\_\_\_\_ command is used to find files and directories in Linux based on specified criteria.
- ix. \_\_\_\_\_ is a utility for compressing and decompressing files in Linux.
- x. To schedule tasks to run automatically at specified times on a Linux server, you can use the \_\_\_\_\_ utility.
- xi. The primary system configuration file in Linux, responsible for system-wide settings, is \_\_\_\_\_.
- xii. The Linux command for changing the ownership of a file or directory is \_\_\_\_\_.

**6. (B) Indicate True or False with justification: (Answer any 5)**

**(2 × 5 = 10 Marks)**

- i. Linux does not load the entire operating system into memory at boot time.
- ii. In Linux, the root user has limited access to system resources and configuration files.
- iii. In Linux, SELinux (Security-Enhanced Linux) is a permissive security framework that allows all actions by default.
- iv. The Apache web server is commonly used for serving dynamic web content but not static web pages.
- v. The "ps" command is used to pause or suspend processes in Linux.
- vi. The "ping" command is used to measure network bandwidth in Linux.

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