भारत मौसम विज्ञान विभाग
सूचना संचार व उपकरण प्रशिक्षण केंन्द्र, नई दिल्ली
(विश्व मौसम विज्ञान संगठन का क्षेत्रीय प्रशिक्षण केंद्र)

India Meteorological Department
Information Communication & Instrumentation Training Centre, New Delhi
Regional Training Centre, World Meteorological Centre

ADVANCED TRAINING COURSE IN METEOROLOGICAL INSTRUMENTATION & INFORMATION SYSTEM
BATCH NO – XV
MID TERM EXAMINATION
Date – 26.05.2025

Time: 03:00 Hours (10:30AM – 01:30PM) **Total Marks: 150 Marks**

Introduction to Radar Meteorology

1. (A) Fill in the blanks. (Any 5) **(2 x 5 = 10 Marks)**

I. The pulse width of long pulse is ----------
II. ----------is generally noticed during winters when temperature inversion occurs.
III. If the minimum range is to be doubled in a radar, the peak power has to be increased by a factor of----------.
IV. The electric field of light has two linear components that are perpendicular to each other, equal in amplitude, and have a phase difference of---------
V. The Doppler dilemma states there is a (n) ----------relationship between the unambiguous range and the unambiguous velocity.
VI. ----------is a process of bending of electro-magnetic radiation while travelling between two media of different refractive index.

1. (B) Short Answer type questions. (Any 5) **(2 x 5 = 10 Marks)**

I. What is super refraction and Sub refraction? What are second trip echoes?

II. What is the frequency range of S, C and X band radars? Which frequency band DWR (S,C and X) requires the largest large size of antenna? State the decreasing order in which atmospheric attenuation is affecting these frequency bands

III. What is the expression for unambiguous range? Explain the effect of PRT on unambiguous range and velocity.

IV. Write the simple form of radar range equation. Why do we study the simple form of radar equation? State the unit of radar cross section.

V. Define Circular polarization.

VI. State the types of Polarization.

Introduction to Satellite Technique

2. (A) Fill in the blanks. (Any 10) **(1 x 10 = 10 Marks)**

I. Electromagnetic radiation moves at the speed of --------
II. Electric and magnetic fields of an electromagnetic radiation are ---------- to each other.
III. Rapid scan facility is available with ---------- imager.
IV. The name of the first weather satellite was ----------Megha-Tropiques is a-------satellite.
V. INSAT-3DR and 3DS are------- satellites.
VI. INSAT-3DS has------ payloads or sensors.
VII. INSAT-3DS sounder has ---------- channels and imager has ----------channels.
VIII. The temporal resolution of INSAT-3DS VHRR is ------ and of sounder is --------.

IX. The sun emits radiation in --------- spectrum, whereas the Earth emits in---------- spectrum.
X. Himawari satellites are operated --------- , whereas GOES satellites are operated by ----------

2. (B) Write True or False. (Any 5) **(1 x 5 = 5 Marks)**

I. Sounder is a payload, which measure radiances from different height of earth atmosphere in various IR channels and give temperature, humidity profiles of the atmosphere.
II. Megha-Tropiques is a LEO satellite.
III. INSAT 3DR Rainfall products are HEM, QPE and IMR.
IV. INSAT 3DS was launched in 2021.
V. The name of the first weather satellite was INSAT
VI. SST and LST from infrared sensors cannot be derived only for cloud-free regions.
VII.

2. (C) Short Answer Type Questions. (Any 2) **(2.5 x 2 = 05 Marks)**

I. Explain Geosationery statelite.

II. Explain Rapid Scan of INSAT 3DR.

III. Explain polar-orbiting satellite?

Concept of AWS & ARG

3. (A) Fill in the blanks. (Any 5) **(1 x 5 = 5 Marks)**

I. Minimum area required for AWS site is ----------
II. Minimum distance required for rain gauge from nearest tree is ----- when height of tree is 10mt.
III. 15.7 cc of rain water corresponds to -------- mm of rainfall.
IV. The transducers of wind sensor fire -------- pulse in opposite direction.
V. The sensors used to measure the temp and humidity is called ----------
VI. The transducers of wind sensor fire ---------- pulse in opposite direction.

3. (B) Write True or False with brief explanation. (Any 5) **(2 x 5 = 10 Marks)**

i. The Space of 15mt * 15mt with good exposure condition is required for AWS establishment.
ii. At least 5 times the height of nearest obstruction is required for measurement of wind.
iii. In AWS, vector averaging of wind speed and direction is done from the 120 samples (@ one per sec).
iv. 0.4mm rainfall can be recorded in AWS:
v. The AWS are installed at remote and inhospitable locations, they required no maintenance.
vi. The response time of “supersonic wind sensor” is immediate.

3. (C) Short Answer Type Questions. (Any 2) **(2.5 x 2 = 5 Marks)**

I. Explain briefly the parameters of AWS instruments?

II. Explain the rainfall sensors working and measurement principle?

III. What are challenges for maintenance of AWS network?

Optical Fibre & Wireless Communication

4. (A) Fill in the blanks. (Any 5) **(1 x 5 = 05 Marks)**

I. The source of light used in optical fibre transmission is -----.
II. The scientific principle behind the working of optical fibres is ---------
III. --------- scattering is an intrinsic loss mechanism in optical fibers caused by microscopic variations in the fiber's density.
IV. ---------- connectors are small form factor connectors widely used in high-density applications.
V. ---------- is a short-range wireless communication technology used for connecting devices like headphones and smartphones.
VI. In cellular communication, the service area is divided into smaller regions called _____.

4. (B) Mark the correct option. (Any 5) **(1 x 5 = 5 Marks)**

I. Which of the following is a common light source used in optical fiber communication systems?
   a. Incandescent bulb
   b. Fluorescent lamp
   c. **Light Emitting Diode (LED)**
   d. Halogen lamp.

II. Which LTE (Long-Term Evolution) is a standard for:
   a. 2G cellular communication
   b. 3G cellular communication
   c. **4G cellular communication**
   d. Satellite communication

III. The cladding performs all except which of the following functions,
   a. Reduces the scattering loss at the surface of the core
   b. Reduces the loss of light from the core
   c. **Reduces mechanical strength**
   d. Protects the fiber core from absorbing surface contaminants.

IV. Which of the following is the primary medium for wireless communication?
   a. Copper cables
   b. Optical fibers
   c. **Electromagnetic waves**
   d. Sound waves

V. Which one of the following generation cell network technologies uses narrow band internet service?
   a. **Second generation**
   b. Fourth generation
   c. Fifth generation
   d. Third generation

VI. Which multiple access technique assigns a unique frequency band to each user?
   a. TDMA
   b. CDMA
   c. **FDMA**
   d. SDMA

4. (C) Short Note. (Any 2) **(2.5 x 2 = 05 Marks)**

I. Define acceptance angle and critical angle of the fibre?

II. Define Attenuation loss and Bending Loss.

III. What do you mean by Handoff?

Introduction to Satellite Communication

5. (A) Fill in the blanks. (Any 10) **(1 x 10 = 10 Marks)**

I. ----------was world's first artificial satellite launched by Soviet Union
II. Transmission cost is independent of coverage area in _____ (**Satellite communication** / conventional terrestrial systems)
III. As the height of a satellite orbit gets lower, the speed of the satellite ----------
IV. Eccentricity of a ---------- orbit is zero.
V. Signal loss is less in MEO orbits as compared to ------- orbits
VI. If the satellite is placed in higher orbit then the camera on board the satellite gives ------ resolution
VII. Low-orbit satellites get affected due to friction caused by collision with ------ and --------.
VIII. Kepler's third law states that, the square of the periodic time of an elliptical orbit is proportional to the cube of its ----------
IX. Angle between orbital and equatorial plane is -------- For geostationary orbit.
X. Transmission delay is least in ---------- Satellite communication system (GEO/**LEO**/MEO)
XI. ---------- are used as carrier signals in Satellite communication.

5. (B) Write True or False with brief explanation. (Any 5) **(2 x 5 = 10 Marks)**

I. Large size of antenna is required for X band communication as compared to Ka band.
II. Every Geostationary orbit is a Geo-synchronous orbit. But, the converse need not be true.
III. Geo Satellite is good for polar coverage.
IV. MEO gives better areal coverage as compared to LEO.

V. Polar Satellites require less time as compared to GEO satellite for orbiting around the earth.
VI. Radio jammer works by the transmission of radio signals that disrupt communications by increasing the signal-to-noise ratio.

Concept of Networking

6. (A) Fill in the blanks. (Any 10) **(1 x 10 = 10 Marks)**

VII. RJ45 stands for ----------.
VIII. UTP and STP stands for ---------- and ----------
IX. CAT 1 can carry only -------
X. Facilitate automatic IP distribution through ----------
XI. Layer 5 in OSI Model is ----------
XII. SSL stands for ----------
XIII. Switch a Layer - ----------device
XIV. MAN stands for ----------
XV. IPv4 address is ------- bits long
XVI. Every machine in a network is identified using unique ----------
XVII. DNS stands for ----------

6. (B) Write True or False with brief explanation. (Any 5) **(2 x 5 = 10 Marks)**

I. A hub connect two WAN networks
II. DNS is assigning dynamic IPs in a LAN
III. The standard protocol of internet is Ethernet
IV. A typical network firewall works in Layer 2
V. MAC address is defined in NIC card.
VI. LAN is used to connect a large geographical area.

Introduction to Web Designing

7. (A) Fill in the blanks / MCQs. (Any 05) **(1 x 5 = 05 Marks)**

I. SPA is acronym for :
   a) Single Page Application
   b) Source Page Application
   c) Simple Page Application
   d) Single Paragraph Application
II. PHP is acronym for :
   a) Hypertext Preprocessor
   b) Pretext Hypertext Preprocessor
   c) Personal Home Processor
   d) None of the above
III. Javascript is **Client** side scripting language.
IV. Which tag is used to display the unordered list?
   a) <OL></OL>
   b) <DL></DL>
   c) <UL></UL>
   d) <LI></LI>
V. What does CSS stand for?
   a) Cascading Sheets Style
   b) Cascading Style Sheets
   c) Centre Style Sheets
   d) Centre Sheets Style
VI. Which one is example of content management system?
   a) Wordpress

b) Internet
c) Browser
d) All of the above

7. (B) Short Answer Type Questions. (Any 4) **(2.5 x 4 = 10 Marks)**

I. Briefly explain frontend and backend web development?

II. What is client server architecture?

III. What is web designing?

IV. Difference between Static and Dynamic Website?

V. Difference between XML and HTML?

Introduction to Radiosonde & Radio theodolites

8. (A) Fill in the blanks / MCQs. (Any 10) **(1 x 10 = 10 Marks)**

I. Radiosonde is a _____ Instrument
a) **In-situ** b) active remote sensing c) passive remote sensing

II. Which of the following parameters is indirectly observed in radio sounding?
a) Temperature b) Humidity c) **Pressure**

III. The frequency used by the RSRW system for the operation is
a) 200 MHz b) **403 MHz** c) 1200 MHz

IV. What is the length of the thread used in GPS Radiosondes
a) 35 m b) **30 m** c) 30 cm

V. The humidity sensor used in the GPS-based radio sounding system is
a. Thermistor b. Digital IC c. **Capacitive type (Hygristor) sensing**

VI. Which radio theodolite has fully automatic balloon tracking?
a) Sameer makes Radiotheodolites b) **IMS-1500** c) RSGE

VII. Which of the following parameters is directly observed in radio sounding?
a) **Temperature** b) Wind direction c) Pressure

VIII. Tracking of balloons in GPS-based radiosonde is
a) Semi-automatic b) **Fully automatic** c) Manual

IX. The Intermediate frequency (IF) of SAMEER radio theodolite
a) **33MHz** b) 40MHz c)120MHz

X. Balloons of RSRW observations are filled with **Hydrogen** and **Helium** gases

XI. IMD is having _____ numbers of Pilotsonde stations
a. 56 b. **62** c. 72

8. (B) Write True or False with brief explanation. (Any 5) **(2 x 5 = 10 Marks)**

I. Pilotsonde is used for atmospheric pressure, temperature and humidity observations.
II. IMD has 06 GUAN standard GPS-based radiosonde stations
III. TEMP messages have two parts
IV. The BUFR-coded message has metadata of radiosonde observations
V. The SODAR system works on Microwave Frequencies.
VI. 1500 IST is a scheduled tome for radio-sounding observations in India.

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