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 & Instrument Training Centre, New Delhi
Regional Training Centre, World Meteorological Centre

ADVANCE TRAINING COURSE IN METEOROLOGICAL INSTRUMENTATION & INFORMATION SYSTEM
BATCH NO – XIV
MID TERM EXAMINATION
Date – 25.11.2024

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

Introduction to Radar Meteorology

1. (A) Short answer type questions. (Any 10) **(1 x 10 = 10 Marks)**

I. What is super refraction and Sub refraction?
II. What is the frequency range of S and X band radars?
III. What is the expression for unambiguous range?
IV. Which frequency band among S, C and X band experiences the maximum attenuation?
V. Define MDS?
VI. Define Missed detection?
VII. Define beam width?
VIII. State the IEEE definition of RCS?
IX. Define Circular polarization.
X. Explain doppler dialemma with its mathematical expression.
XI. State the types of Polarization.

1. (B) Long answer type questions. (Any 2) **(2 x 5 = 10 Marks)**

I. State and Explain the Maxwell's equation.
II. Draw and explain the radar pulse timing diagram. Clearly indicate the rise time, fall time, transmission time, reception time, and pulse repetition time (PRT). Explain how Pulse width affects the radar range.
III. Comment on the attenuation characteristics of S, C and X band DWR frequencies with relevant graphs. Comment on why an S-band radar frequency is a preferred choice for installation along the coastal region prone to cyclones.

Introduction to Satellite Technique

2. (A) Multiple Choice questions. **(1 x 5 = 5 Marks)**

I. What are the Geophysical parameters are being generated from INDAT-3D/3DR SOUNDER data operationally,
a. Lifted Index b. Wind Index c. Total Perceptible Water
d. Dry Microburst Index e. All of them f. None of these
II. Modulation Technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite to receive the signals
a. QPSK & BPSK b. BPSK & QPSK c. None of them
III. Encoding technique used in Imager and Sounder.
a. NRZ-L & NRZ-S b. NRZ-S & NRZ-LIC c. None of them
IV. Imager and Sounder payloads of INSAT 3D/3DR satellite is having frequency to receive data.
a. 4781 MHz and 4798 MHz b. 4798 MHz and 4781 MHz c. None of them

V. What are the channel suitable for detection of Daytime Fog?
a. Visible Channel b. Infrared Channel c. All of them

2. (B) Fill in the blanks. (1 x 5 = 5 Marks)

I. INSAT series of _____satellite.
II. INSAT-3DR is located at _____ & INSAT-3D is located at _____
III. INSAT-3DR have four payloads viz _____, _____, _____, _____.
IV. INSAT-3DR payloads having _____ channel Imager and _____channel Sounder.
V. _____satellite looks the fixed area of earth surface al all the time. Whereas, _____orbiting satellite cover the entire earth surface at regular time intervals.

2. (C) Write True or False. (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. Geostationary and Geosynchronous orbits are same.
III. INSAT 3DR Rainfall product from sounder.
IV. INSAT 3DR Rainfall products are HEM, QPE and IMR.
V. INSAT 3DS was launched in 2021.

2. (D) Short Answer Type Questions. (2.5 x 2 = 05 Marks)

I. Explain Remote Sensing.
II. Explain Rapid Scan of INSAT 3DR.

Concept of AWS & ARG

3. (A) Fill in the blanks. (1 x 4 = 4 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 10 mt.
III. 15.7 cc of rain water corresponds to ____ mm of rainfall .
IV. The transducers of wind sensor fire _____ pulse in opposite direction.

3. (B) Write True or False with brief explanation. (2 x 3 = 6 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).

3. (C) Short Answer Type Questions. (Any 2) (5 x 2 = 10 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 ____ (ARC Lamp/LED/Mercury Lamp).
II. Refractive Index of Cladding is _____ Core of Optical fibre. (Less/ More)
III. The scientific principle behind the working of optical fibres is _____.

IV. Fibre cables used for 'Fibre to Home' installation are _____(Single mode/Multimode graded/Multimode Step).
V. The loss of optical power as light travels along a fibre is called ____ (Dispersion/Scattering/Attenuation/Absorption).
VI. In Step Index fibres, refractive Index changes _____. (abruptly/ gradually)
VII. The maximum outdoor range in WIFI wireless communication technology is _____?(10m,100m,1000m)

4. (B) Short Answer Type Questions. (Any 6) (1 x 6 = 6 Marks)

I. What is Mobile communication?,
a. Allows to communicate from different locations without the use of physical medium
b. Allows to communicate from different locations with the use of physical medium
c. Allows to communicate from same locations without the use of physical medium
d. Allows to communicate from same locations with the use of physical medium.

II. 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.

III. Which of the following is not a TDMA standard of 2.5G network?
a. GPRS b. GSM
c. HSCSD d. EDGE

IV. Which of the following is a universally adopted shape of cell?
a. Hexagon b. Square
c. Circle d. Triangle

V. On which of the following frequencies does a Wi-Fi network work?
a. 2.4 MHz b. 5 MHz
c. 10 GHz d. 5 GHz

VI. The power control frequency of wideband CDMA is?
a. 1500 Hz b. 2 Hz
c. 1800 Hz d. None of the above

VII. 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

4. (C) Short Note. (Any 2) (2 x 2 = 04 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. _____ are used as carrier signals in Satellite communication.
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. Angle between orbital and equatorial plane is _____ For geostationary orb
VI. Signal loss is less in MEO orbits as compared to _____ orbits

VII. Orbital slots are allocated to the Satellite operator by _____
VIII. Low-orbit satellites get affected due to friction caused by collision with _____ and _____
IX. Kepler's third law states that, the square of the periodic time of an elliptical orbit is proportional to the cube of its _____
X. If the satellite is placed in higher orbit then the camera onboard the satellite gives _____ resolution
XI. Transmission delay is least in _____ Satellite communication system (GEO/LEO/MEO)
XII. _____ gives the average value of the angular position of the satellite with reference to perigee

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 Every Geostationary orbit is a Geo-synchronous orbit. But, the converse need not be true.
II. Geo Satellite is good for polar coverage
III. Radio jammer works by the transmission of radio signals that disrupt communications by increasing the signal-to-noise ratio
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. The point farthest from the earth in a satellite orbit is known as perigee.

Concept of Networking

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

I. RJ45 stands for _____.
II. UTP and STP stands for _____ and _____.
III. Optical fiber cables transmit the data using principle of _____ and are known for their low signal attenuation
IV. Facilitate automatic IP distribution through _____.
V. DNS stands for _____.
VI. The default HTTP and HTTPs port used for Web Server are port _____ and _____.
VII. SSL stands for _____
VIII. Switch a Layer _____ device
IX. WAN stands for _____.
X. IPv4 address is _____ bits long
XI. Every machine in a network is identified using unique _____.
XII. NIC in a machine 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. CAT 6 is the most commonly used telephone cable
III. Layer 5 in OSI model is
IV. Can private IP address be duplicated outside network
V. The standard protocol of internet is Ethernet
VI. Router operates on Layer 2
VII. MAC address is defined in NIC card.

Introduction to web designing

7. (A) Fill in the blanks / MCQs. (Any 06) **(1 x 6 = 06 Marks)**

I. What is Mozilla Firefox?
   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. HTML stands for _____.

IV. Javascript is …….. side scripting language.

V. Which tag is used to display the unordered list ?
   a) <OL></OL>
   b) <DL></DL>
   c) <UL></UL>
   d) <LI></LI>

VI. What does CSS stand for?
   a) Cascading Sheets Style
   b) Cascading Style Sheets
   c) Centre Style Sheets
   d) Centre Sheets Style

VII. What do I need to get onto the Internet?
   a) Computer
   b) Modem
   c) Browser
   d) All of the above

7. (B) Short Answer Type Questions. (Any 3) **(3 x 2 = 06 Marks)**

I. PHP doesn't support database? (True/False) Explain briefly.
II. What is client server architecture?
III. What is web designing?
IV. List the three ways of using CSS in HTML?

7. (C) Short Note. (Any 1) **(1 x 3 = 03 Marks)**

I. Difference between Static and Dynamic Website??
II. Describe briefly elements of web page?

Introduction to Radiosonde & Radio theodolites

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

I. IMD has a network of _____Stations in its RS/RW upper air network.
   a. 56 b. 62 c. 95
II. Which one is GUAN station
   a. New Delhi b. Kochi c. Jammu
III. The frequency used by the RSRW system for the operation is
   a. 200 MHz b. 403 MHz c. 1200 MHz
IV. Radiosonde is a _____ Instrument
   a. In-situ b. active remote sensing c. passive remote sensing
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. Which is not a scheduled time for the upper air balloon observations?
   a) 09:30 IST b) 05:30 IST c) 17:30 IST
IX. Tracking of balloons in GPS-based radiosonde is
   a) semi-automatic b) Fully automatic c) Manual
X. The Intermediate frequency (IF) of SAMEER radio theodolite
   a) 33MHz b) 40MHz c)120MHz
XI. Balloons of RSRW observations are filled with _____ and _____ gases
XII. 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. Thermistor is used for humidity measurements in GPS Radiosondes.
II. Pilotsonde is used for atmospheric pressure, temperature and humidity observations.
III. The SODAR system works on Microwave Frequencies.
IV. IMD has 06 GUAN standard GPS-based radiosonde stations
V. GPS Radiosonde is an active remote sensing method of observation.
VI. 1500 IST is a scheduled tome for radio-sounding observations in India
VII. TEMP messages have four parts

_____***_____