

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
Regional Training Centre, World Meteorological Centre

ADVANCE TRAINING COURSE IN METEOROLOGICAL INSTRUMENTATION & INFORMATION SYSTEM

BATCH – XII

MID TERM EXAMINATION

Date – 29.05.2023

Time: 03:00 Hours (10:30AM – 01:30PM)

Total Marks: 150 Marks

Principle of Radar and Radar Meteorology

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

(1 x 10 = 10 Marks)

- I. IMD has installed a number of S-band Radars in entire coastline to observe and track _____.
- II. If the bright colour patch (dBZ<30) then it is _____ rain.
- III. The most common wavelength used for RF transmission in C-band Radars is _____ centimetre.
- IV. _____ product is used to determine horizontal wind at different levels.
- V. Rainfall is derived from Reflectivity using _____ formula.
- 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. The unit of precipitation intensity product is _____
- IX. Presentation of longer range echoes in shorter range displays are known as _____ folded echoes.
- X. PRF is _____ proportional to unambiguous range.
- XI. Antenna is protected by a spherical covering called _____.
- XII. The area directly above the radar is called cone of _____.

1. (B) Write true or false with brief explanation. (Any 5)

(2 x 5 = 10 Marks)

- I. RADAR is an acronym for Range Detection with Radio.
- II. S-band radar are economic than C-band radar.
- III. 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.
- IV. Velocity folding occurs when PRT is high.
- V. The velocity component of a target relative to the radar beam is known as the "Spectral Width".
- VI. The Range of X-band Radar is higher than S-band Radar.
- VII. Velocity folding usually occurs when observing Cyclone.

Principle of Satellite Technique

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

(1 x 10 = 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 and Imager & Sounder payloads of INSAT-3D/3DR satellite is having _____ Frequency & _____ frequency to receive the data.
- III. _____ & _____ encoding technique used in imager and sounder of INSAT-3D/3DR satellite.
- IV. _____ & _____ modulation technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite to receive the signals.
- V. DRT payload of INSAT-3D satellite is having uplink frequency _____ and downlink Frequency _____.
- VI. GPS satellites Carries Atomic Clock on board and transmit two low power radio signals, L1= _____ and L2 = _____.
- VII. Multipath effects are removed by _____ Antennae.
- VIII. _____ hrs. Orbital period of GPS Satellites are in orbit around the earth.
- IX. Weighted Mean temperature of the vertical atmosphere $T_m = 55.8 + 0.77 * \text{_____}$.
- X. Tropospheric delay = Hydrostatic Delay + * _____.
- XI. _____ & _____ data rate is used to receive the signal of Imager and Sounder of INSAT-3D/3DR satellite.
- XII. GNSS Signal delays more in the Troposphere due to _____.

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

(2 x 5 = 10 Marks)

- 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.
- VI. In order to reduce the multipath effects a 5° elevation cut-off angle is fixed.
- VII. When the GNSS signal passes through the troposphere, Refractivity is associated with changes in electron plasma density or TEC between 50 and 400 km AGL.

Introduction about AWS and ARG

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

(1 x 10 = 10 Marks)

- I. The GPS antenna and GPS receiver used in satellite based AWS for _____.
- II. Soil sensors used in Agro AWS for measurement of _____ and _____.
- III. Electronic Sunshine duration sensors used in Agro AWS to measure _____.
- IV. ARG System has two meteorological sensors and are _____ and _____.
- V. GPRS stands for _____.
- VI. A datum value is used in satellite communication of AWS for measuring _____.
- VII. Antenna used for satellite communication in AWS is _____.
- VIII. Two winds sensors are installed in Agro AWS are at heights _____ and _____.
- IX. Satellite-based AWS has one-way communication whereas GPRS based AWS has _____ communication.
- X. GPS stands for _____.
- XI. IOT stands for _____.
- XII. Snow gauge sensors used ASG for measurement of _____.

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

(2 x 5 = 10 Marks)

- I. The height of mast of IMD ARG System is 10m.
- II. A Polar satellite is being used by IMD for communication in satellite based AWS.
- III. Conventional measuring jar of ORG can be used to calibrate TBRG of AWS/ARG.
- IV. Snow gauge depth measurement is like a TBRG sensor with Heater.
- V. The SMF battery of AWS /ARG / Agro AWS is charged by Electrical charger.
- VI. The sensing element of Temperature in AT/RH sensors is Pt 100.
- VII. Conventional Thermometer can be used for the AWS.

Concepts of optical fibre & Wireless Communication

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

(1 x 6 = 06 Marks)

- I. Light propagates in Optical fibre due to which phenomenon _____.
 - a. Scattering.
 - b. Dispersion.
 - c. Refraction.
 - d. Total Internal Reflection.
- II. Absorption and Scattering losses in Optical fibre are due to impurities in material of fibre is _____. (True/ False).
- III. Multi Mode fibres are _____ than Single Index fibres. (thicker/ thinner)
- IV. In Step Index fibres, refractive Index changes _____. (abruptly/ gradually)
- V. Refractive Index of Cladding is _____ Core of Optical fibre. (less/ more)
- VI. Attenuation in Optical Fibres is _____ as compared to Copper pair cables. (less/ more)
- VII. Law governing Optical fibre communication is _____.
- VIII. Detectors used in Optical fibres are called _____.

4. (B) Short Answer Type Questions. (Any 3)

(3 x 2 = 06 Marks)

- I. Main functions of Cladding are _____ and _____.
- II. Two applications of Optical Fibre cables.
- III. What are Radiative Losses in Optical Fibres and how do they affect Light propagation in Optical Fibres?
- IV. Sources of Light used in Optical fibre Communication are _____ and _____.
- V. 1G & 2G Mobile technologies was optimized for Voice / Data communications and used Analog / Digital communication techniques.

4. (C) Short Note. (Any 1)

(3 x 1 = 03 Marks)

- I. Give 3 disadvantages of Optical fibre cables with respect to twisted pair copper cables.
- II. Mention and explain any two types of losses in Optical Fibre Cable.

Principle of 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 orbit.
- 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.
- 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. Radio jammer works by the transmission of radio signals that disrupt communications by increasing the signal-to-noise ratio.
- V. MEO gives better areal coverage as compared to LEO.
- VI. Polar Satellites require less time as compared to GEO satellite for orbiting around the earth.
- VII. The point farthest from the earth in a satellite orbit is known as perigee.

Introduction to Networking

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

(1 x 10 = 10 Marks)

- I. Wi-Fi stands for _____.
- II. _____ is a switching technique that establishes a dedicated path between sender and receiver.
- III. OSI model has _____ layers.
- IV. WAN stands for _____.
- V. Switch works on _____ Layer.
- VI. Speed of Cat 6 cable is _____.
- VII. Router is a layer _____ device.
- VIII. Class E IP is reserved for _____.
- IX. IPv6 is _____ bit address.
- X. _____ transfers information in or out sequentially one bit at a time.
- XI. RJ is abbreviated for _____ in RJ45 type cable connector.
- XII. CAT 1 cable carries _____ only.

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

(2 x 5 = 10 Marks)

- I. TCP model has 5 layers.
- II. Speed of Cat 7 cable is 1000Mbps.
- III. Cat 1 carries only voice.
- IV. Transfer rate of Cat 6 and Cat 7 cable is same.
- V. MAN is larger than WAN.
- VI. In Packet switching, a dedicated network path is established between sender and receiver.
- VII. IPv4 address is 30 bit unique address.

Introduction to web designing

7. (A) Fill in the blanks. (Any 06)

(1 x 6 = 06 Marks)

- I. What is Google Chrome?
 - a) An Icon.
 - b) A File Manager.
 - c) A Browser.
 - d) The Internet.
- II. 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 it's very user friendly.
 - d) All of the above.
- III. PHP is acronym for:
 - a) Hypertext Preprocessor.
 - b) Pretext Hypertext Preprocessor.
 - c) Personal Home Processor.
 - d) None of the above.
- IV. HTML stands for _____.
- V. PHP is _____ server side scripting language.
- VI. Which tag is used to display the numbered list?
 - a)
 - b) <DL></DL>
 - c)
 - d)
- VII. What does XML stand for?
 - a) eXtra Modern Link
 - b) eXtensible Markup Language
 - c) Example Markup Language
 - d) X-Markup Language
- VIII. 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. 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.

7. (C) Short Note. (Any 1)

(3 x 1 = 03 Marks)

- I. What is a CSS file and what are some benefits of using it?
- II. What is JavaScript? Describe briefly?

Introduction to RSRW

8. (A) Fill in the blanks. (Any 10)

(1 x 10 = 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 radio sounding 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 ofType.
a) Co-axial Collinear b) 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 WMO-GUAN network.
a) Chennai b) Portblair c) Srinagar
- X. The observation of upper winds in radio sounding is based on.
a) Drift of balloon in air b) Atmospheric pressure c) Atmospheric humidity
- XI. Which of the following parameter is directly observed in radio sounding.
a) Temperature b) Wind Direction c) Pressure
- XII. Wind profiler's works on
a) Soundwaves b) Microwaves c) Light waves

8. (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. RSGE sounding systems are used as stand by equipment at each of the RS/RW station.
- IV. Radiotheodolite systems use super-hetrodyne type of Receivers,
- V. Tracking of pilot balloon (PB) in optical theodolites is a fully automatic observation.
- VI. Wind observation in GPS based radiosounding systems are based on the drift of the balloon in atmosphere.
- VII. 0300 UTC is a scheduled observation time for radiosounding observations in India.
