

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 – X**

MID TERM EXAMINATION  
Date – 31.05.2022

Time: 03:00 Hours (1030AM – 0130PM)

Total Marks: 150 Marks

**Introduction to Radar Meteorology**

**1. (A) Fill in the blanks – (Any 5)**

**(1x5 = 5 Marks)**

- I. IMD has installed a number of S-band Radars in entire coastline to observe and track .....
- 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 most common wavelength used for RF transmission in C-band Radars is ..... Centimeter.
- IV. Doppler Weather Radars have benefit over the conventional Radars due to it's ..... product.
- V. 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 .....
- VI. .... maybe observed when Reflectivity is above 60 dbZ.
- VII. The full form of PRF is .....

**(B) True or false with brief explanation – (Any 5)**

**(2x5 = 10 Marks)**

- i. RADAR is an acronym for Range Detection with Radio.
- ii. S-band radar are economic than C-band radar.
- iii. Plan Position Indicator product (PPI) is in which reflectivity, radial velocity or spectral width is Presented on a conical surface of a constant elevation as an output image.
- iv. High PRF increases the unambiguous range.
- v. Low PRF reduces the unambiguous velocity.
- vi. Super refraction occurs during temperature inversion.
- vii. X band has a larger Antenna than C band for same beam width.

**(C) Write short Notes – (Any 1)**

**(5x1 = 5 Marks)**

- i. Explain Doppler Dilemma with formulas.
- ii. Explain any 3 products from DWR.

### Introduction to Concept of Networking

#### 2. (A) Fill in the blanks – (any 5)

(1x5 = 5 Marks)

- I. Wi-Fi stands for \_\_\_\_\_.
- II. 2. \_\_\_\_\_ is a switching technique that establishes a dedicated path between sender and receiver.
- III. OSI model has \_\_\_\_\_ layers.
- IV. WAN stands for \_\_\_\_\_.
- V. 5. Switch works on \_\_\_\_\_ Layer.
- VI. 6. Speed of Cat 6 cable is \_\_\_\_\_.

#### (B) True or false – (any 3)

(2x3 = 6 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.

#### (C) Short Answer – (any 3)

(3x3 = 9 Marks)

- I. Name layers of OSI model?
- II. What is the speed and frequency of CAT 6 7 CAT 7 cable?
- III. Explain MAN & WAN?
- IV. What is Modem?
- V. Define different types of cat cables?
- VI. Explain serial and parallel port?
- VII. Define Host, Hub?
- VIII. Define Router?

### Introduction to Satellite Communication

#### 3. (A) Fill in the blanks (Any 4)

(1x4 = 4 Marks)

- i. \_\_\_\_\_ states that for equal time intervals, the satellite will sweep out equal areas in its orbital plane, focused at the barycentre.
- ii. Eccentricity of a \_\_\_\_\_ orbit is zero.
- iii. In Satellite orbit the point farthest from the earth is known as \_\_\_\_\_.
- iv. As the height of a satellite orbit gets lower, the speed of the satellite \_\_\_\_\_.
- v. Transmission delay is least in \_\_\_\_\_ Satellite communication system  
(LEO/GEO/MEO)
- vi. Orbital slots are allocated to the Satellite operator by \_\_\_\_\_.
- vii. Main external perturbations for an orbiting Satellite come from \_\_\_\_\_ And \_\_\_\_\_.

**(B) True or false (Any 5)**

**(2x5 = 10 marks)**

- I. Satellite doesn't deviate from its orbit and moves with certain velocity in that orbit, when Centripetal force is half of the Centrifugal forces.
- II. Orbital velocity doesn't depend on the distance from satellite to centre of the Earth
- III. The value of eccentricity of an elliptical orbit lies between one and two.
- IV. Large size of antenna is required for X band communication as compared to Ka band.
- V. GEO satellites are good for polar coverage.
- VI. If the satellite is placed in higher orbit then the camera onboard the satellite gives better resolution.
- VII. Three kind of propagation were used earlier for communication up to some distance.
- VIII. The point where the orbit crosses the equatorial plane going from south to north is known as Inclination.

**(C) Short Answer – (any 2)**

**(3x2 = 6 Marks)**

- i. Orbital slots.
- ii. Kepler's law of orbital motion.
- iii. Future of Satellite Communication.

**Introduction to Satellite technique**

**4. (A) Fill in the blanks (Any 8)**

**(1x8 = 8 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 and \_\_\_\_\_ & \_\_\_\_\_ data  
Rate is used to receive the signal of 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 + \_\_\_\_\_.

**(B) True or false (Any 3)**

**(2x3 = 6 Marks)**

- i. The Antenna Control Unit (ACU) is used for steering the antenna either manually or Automatically.
- ii. In the present ground receiving 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. When GNSS signal passes through the troposphere, Refractivity associated with changes In electron plasma density or TEC between 50 and 400 km AGL.
- v. GNSS Signal delays more in the Troposphere due to water vapour.

**(C) Short Answer**

**(3x2 = 6 Marks)**

- i. Explain the ground receiving system of INSAT-3D/3DR satellite with block diagram.
- ii. Give the short note on INSAT-3D/3DR satellite payloads.

**Introduction to Web Designing**

**5. (A) Mark the correct one (Any 3)**

**(1x3 = 3 Marks)**

- i. PHP is acronym for:
  1. Hypertext Pre-processor
  2. Pretext Hypertext Pre-processor
  3. Personal Home Processor
  4. None of the above
- ii. What is the purpose of using CMS?
  1. To make regular web designing easy.
  2. To reach out to audience with low coding knowledge
  3. Because it's very user friendly
  4. All of the above
- iii. HTML stands for \_\_\_\_\_.
- iv. PHP is \_\_\_\_\_ server side scripting language.
- v. XML is a mark-up language much like \_\_\_\_\_.

**(B) Answer the following (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?

**(C) Short Answer – (any 2)**

**(3x2 = 6 Marks)**

i. What is the key difference between HTML and XML?

ii. List briefly features of Content management system?

iii. What is PHP? Describe briefly.

**Introduction to Optical Fibre and Wireless Communication**

**6. (A) Attempt (Any 5)**

**(1x5 = 5 Marks)**

- i. Channel Used in Optical Fiber Communications are \_\_\_\_\_
- ii. Undersea Optical Fiber Cables are also called \_\_\_\_\_
- iii. Main principle of Optical Fiber communication is \_\_\_\_\_
- iv. Light propagates in Optical fiber is due to –
  - i. Scattering
  - ii. Dispersion
  - iii. Refraction
  - iv. Total Internal Reflection.
- v. Which type of Optical Fibers can transmit multiple signals- Single Mode or Multi Mode?
- vi. Which type of Optical Fibers is thicker - Single Mode or Multi Mode?
- vii. In which type of Optical Fibers, Refractive Index is highest at the centre of the fiber and decreases gradually when moving away from the centre of fiber– Step Index Mode or Graded Index Mode?
- viii. Radioactive losses in Optical Fibers occur due to bending of Optical fiber cables. (True/ False).
- ix. Absorption and Scattering losses in Optical fiber are due to impurities in material of fiber. (True/ False).

**(B) Attempt (any 5)**

**(2x5 = 10 Marks)**

- i. Two Light Sources in Transmitters are- \_\_\_\_\_ & \_\_\_\_\_.
- ii. Main functions of Cladding are \_\_\_\_\_ and \_\_\_\_\_.
- iii. Absorption losses in Optical fiber are due to \_\_\_\_\_.
- iv. Scattering Losses in Optical Fiber are caused by \_\_\_\_\_.
- v. Radioactive losses in Optical Fibers are \_\_\_\_\_.
- vi. Advantages of Optical Fibers are- (Tick which ever are applicable) .
  - a) Can carry much more information
  - b) Much higher data rates
  - c) Immune to electromagnetic noise
  - d) Very less chances of cross talk between nearby cables
  - e) Cost of Network equipment is high
  - f) All of the above

**Introduction to AWS and ARG**

**7. (A) Fill in the blanks (Any 5)**

**(1x5 = 5 Marks)**

i. The GPS antenna and GPS receiver used in AWS for \_\_\_\_\_.

ii. Soil sensors used in Agro AWS for measurement of \_\_\_\_\_ and \_\_\_\_\_.

- iii. Electronic Sunshine duration sensors used in \_\_\_\_\_ AWS.
- iv. IMD ARG System has two meteorological sensors and are \_\_\_\_\_ and \_\_\_\_\_.
- v. GPRS stands for \_\_\_\_\_.
- vi. A snow gauge is used in AWS for measuring \_\_\_\_\_.
- vii. Antenna used for satellite communication is \_\_\_\_\_.

**(B) True or false (Any 6)**

**(2x6 = 12 Marks)**

- i. Wind sensor used in IMD AWS System has Ana log output.
- ii. The height of mast of AGRO AWS System should be 10 m.
- iii. A Polar satellite is being used by IMD for communication in satellite based AWS.
- iv. TBRG is an Ana log sensor in AWS.
- v. Conventional measuring jar of ORG can be used to calibrate TBRG of AWS/ARG.
- vi. Snow gauge depth measurement is like a TBRG sensor with Heater.
- vii. Pressure sensors used in AWS give mean sea level pressure (MSLP)

**(C) Short Answer – (any 1)**

**(3x1 = 3 Marks)**

- i. What is difference between AWS and Agro AWS? What are sensors used in AWS and Agro AWS.
- ii. What are advantages and disadvantages of Automatic Weather conditions?

**Introduction to Radio sonde / Radio theodolites**

**8. (A) Choose the correct one (Any 6)**

**(1x6 = 6 Marks)**

- i. Which of the following is not a scheduled time of RS/RW observations
  - i) 0530 IST
  - ii) 0830 IST
  - iii) 1730 IST
- ii. The GPS based sounding system operates on the following frequency:
  - i) 401 MHz
  - ii) 403 MHz
  - iii) 800 MHz
- iii. The Intermediate frequency (IF) of SAMEER radios theodolite is \_\_\_\_\_ MHz
  - i) 10.7 MHz
  - ii) 33 MHz
  - iii) 68 MHz
- iv. The antenna used in IMS based system is of \_\_\_\_\_ Type.
  - i) Co-axial Collinear
  - ii) Omni-directional
  - iii) Helical
- v. Which of the following parameter is not directly observed in RS/RW observation?
  - i) Temperature
  - ii) Relative Humidity
  - iii) Wind speed
- vi. IMD has a network of ..... Stations in its RSRW upper air network.

i) 56

ii) 62

iii) 99

(vii) The Humidity sensor in GPS based radio sounding is of.

i) Bead type

ii) Digital IC

iii) capacitive type

**(B) True or false (Any 4)**

**(2x4 = 8 Marks)**

- I. Observation of Pressure in radio sounding systems is based on the drift of the balloon in the air.
- II. GPS based systems are semi-automatic systems.
- III. RS/RW ascents are not necessarily to be taken at synoptic hours.
- IV. Pressure sensor cannot be used in GPS based radiosonde.
- V. A band pass filter is provided in the transmitter circuit of radiosonde.

**(C) Short Answer (Any 1)**

**(6x1 = 6 Marks)**

- I. Explain the advantages of GPS based radio sounding system.
- II. Describe the parameters observed in RS/RW observations.