भारत मौसम विज्ञान विभाग
सूचना संचार एंव उपकरण प्रशिक्षण केंन्द्र, नई दिल्ली
(विश्व मौसम संगठन का क्षेत्रीय प्रशिक्षण केंन्द्र, नई दिल्ली)
Advance Training Course in Meteorological Instrumentation & Information System (Batch No – XIV)

Final Exam: Paper –III **Max. Marks -100**

Date: 03.03.2025 **Time: - 10:30-13:30**

MET INSTRUMENTS

1. (A) Fill in the blanks: (Answer any 10) **(1 × 10 = 10 Marks)**

i. In hair hygrograph the length of hair used is approximately _____.
ii. The mechanical instrument for continuous recording of atmospheric pressure at Class-I observatory is _____.
iii. The bimetallic thermograph consists of metal strips made of _____or _____.
iv. At Class-I observatory the thermograph is generally installed in _____.
v. Visibility Sensors to get MOR & RVR shall be put _____m above ground.
vi. In potentiometric windvane 90 degree denotes_____ Kohms and 270 deg denotes _____ Kohms resistance.
vii. The sensor used in ATRH Humidity part is _____.
viii. The ceilometer functions according to the _____principle.
ix. IMD has _____ GUAN standard upper air stations
x. The typical frequency range used in the Microwave radiometer is _____GHz
xi. GPS Radiosonde operates at _____MHz radio frequency range.
xii. GPS Radiosonde uses a _____ to measure the atmospheric relative humidity.

1. (B) Short Answer type Questions: (Answer any 5) **(2 × 5 = 10 Marks)**

i. What are essential parts of self-recording instruments
ii. Explain the basic principle on which Dynes Pressure Tube Anemograph Works.
iii. Explain the working principle of Bimetallic Thermograph
iv. What are the advantages of GPS pilot-sonde
v. What are the advantages of the GPS Radio Occultation (GPS RO) method?
vi. True/ False with Justification: The sensing element of Temperature in AT/RH sensors is Pt 100.
vii. True/ False with Justification: Humidity sensor is resistive sensor.
viii. True/ False with Justification: GPS RO is an in-situ observation method.

AWS & ARG

2. (A) Fill in the blanks: (Answer any 5) **(1 × 5 = 5 Marks)**

i. Antenna used for satellite uplink in AWS is _____
ii. Use of GPS antenna in AWS is for _____
iii. Full form of GPRS is _____
iv. Full form of GSM _____
v. Full form of SDHC is _____
vi. Type of sensor used for measuring atmospheric pressure is _____
vii. Number of AWS which can be accommodated in TDMA are _____

2. (B) Short Answer type Questions: (Answer any 5) (2 × 5 = 10 Marks)

i. What are the advantages of AWS?
ii. Enlist characteristics of power supply of AWS.
iii. What is the sampling interval of different meteorological parameters in AWS?
iv. What are different types of AWS?
v. Explain working of Soil moisture sensor.
vi. Derive expression of wind velocity for 2 transducer based ultrasonic wind sensor

SATELLITE COMMUNICATION SYSTEM

3. (A) Fill in the blanks: (Answer any 9) (1 × 9 = 9 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. The INSAT 3DR satellite is located at _____ °E.
vii. DRT payload of INSAT-3D satellite is having uplink frequency _____ and downlink frequency_____.
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 proportional to the cube of its _____
x. Transmission delay is least in _____ satellite communication system (GEO/LEO/MEO)
xi. _____&_____ modulation technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite to receive the signals.

3. (B) Indicate True or False with justification: (Answer any 3) (2 × 3 = 6 Marks)

i. Satellite deviates from its orbit when Centripetal force is equal to the Centrifugal forces.
ii. If the satellite is placed in lower orbit then the camera onboard the satellite gives better resolution.
iii. Wien's Displacement Law states that radiation emitted by a black body is a function of wavelength ( ) and temperature ( ).
iv. Electromagnetic radiation exhibit singular nature properties

3. (C) Explain in brief: (Answer any 5) (2 × 5 = 10 Marks)

i. INSAT-3DR/3DS Data Relay Transponder
ii. Types of meteorological satellite
iii. Atmospheric Window
iv. What are the merits and demerits of a Polar orbiting satellite?
v. Satellite Aided Search & Rescue (SAS & R)
vi. CCD Cameras

METEOROLOGICAL SATELLITE

4. (A) Fill in the blanks: (Answer any 9) (1 × 9 = 9 Marks)

i. Full form of TIROS
ii. Spatial resolution of visible channel of INSAT 3D/DS _____
iii. _____is the first Indian meteorological satellite to have a sounder
iv. The meteorological payloads of INSAT 3D/DS are _____ and _____
v. Full form of MADRAS
vi. Full form of ATMS
vii. Full form of IASI
viii. Full form of ASCAT
ix. Full form of ROSA
x. _____ was the India's first exclusive communication satellite
xi. The spectral band from _____ to _____ is known as the reflective region.
xii. _____ and _____ are the most common instrument in use, collecting reflected and emitted radiation in a wide range of frequencies.

4. (B) Indicate True or False with justification: (Answer any 3) (2 × 3 = 6 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. Ka band is cost effective as compared to X band for satellite communication.
iii. INSAT 3D & 3DR satellites are operated in a staggered mode to receive data every half hourly
iv. The resolution of INSAT 3R TIR1 imager channel is 8 Km.

4. (C) Explain in brief: (Answer any 5) (2 × 5 = 10 Marks)

i. State Planck's law.
ii. Explain Rapid Scan of INSAT 3DR.
iii. What are the Geophysical parameters are being generated from INDAT-3D/3DR SOUNDER data operationally.
iv. What are the types of remote sensors?
v. Draw a block diagram of earth station system/ground receiving system.
vi. Write down the resolution of following imager channel from INSAT 3DR satellite.
    a. Visible
    b. MIR
    c. SWIR
    d. Water vapour

MARINE METEOROLOGICAL SERVICES

5. (A) Fill in the blanks: (Answer any 10) (1 × 5 = 5 Marks)

i. Marine weather conditions play a critical role in navigation and route planning. The root directory in Linux is represented by ____
ii. Oil and gas exploration at sea is a near shore activity. (True / False)
iii. Long term monitoring and analysis of Marine weather data provides insights into climate change. (True / False)
iv. List two observation systems over the ocean.
v. Moored buoy data can't be used to monitor the cyclones. (True / False)
vi. The error in the cyclone landfall point was reduced due to installation of coastal AWS. (True / False)
vii. Coastal Sea Level is measuring using _____.
viii. Wave height over oceans is measured in _____.

RADIO REGULATION

6. (A) Fill in the blanks: (Answer any 5) (1 × 5 = 5 Marks)

i. Radiodetermination is _____.
ii. Frequency Range for Band Number 5 is _____ .
iii. The Ka-band radar operated in _____.
iv. The bandwidth of 180.5 kHz is represented in the designation of emission as _____.
v. 5G cell phone work in _____ frequency range.
vi. _____ radiocommunication services are covered under NFAP-2018

OZONE & AIR POLLUTION

7. (A) Fill in the blanks: (Answer any 5) (1 × 5 = 5 Marks)

i. Excessive release of carbon dioxide in the atmosphere is the cause of _____ effect which produces global warming.
ii. The pollutants such as NO2, SO2, and SO3 dissolved in the moisture of air are the cause of _____.
iii. A decrease in the concentration of ozone in the stratosphere is the cause of the formation of _____ holes.
iv. _____ and _____ are two natural sources of air pollution.
v. Clouds are present in _____ (stratosphere/ troposphere /mesosphere/ thermosphere)
vi. CFCs are not recommended to be used in refrigerators because they _____ (Increase temperature/ Affect environment/ Deplete ozone/ Affect human body)
vii. The permissible concentration of PM10 in the air on annual time weighted average as per NAAQS by CPCB of notification of year 2009 is _____ (60 µg/m3 **/** 40 µg/m3 **/** 50 µg/m3 **/** 20 µg/m3)

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