भारत मौसम विज्ञान विभाग

सूचना संचार एवं उपकरण प्रशिक्षण केंद्र, नई दिल्ली

(विश्व मौसम विज्ञान संगठन का क्षेत्रीय प्रशिक्षण केंद्र, नई दिल्ली)

Advance Training Course in Meteorological Instrumentation & Information System (Batch No – XV)

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

Date:29.08.2025 **Time:-10:30-13:30 IST**

MET INSTRUMENTS

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

i. Temperature coefficient of expansion of INVAR used in thermograph is ____ compared to bronze or steel.
ii. Markings on chart of SRRG are made for ____ hours.
iii. The mechanical instrument for continuous recording of atmospheric pressure at Class-I observatory is _____
iv. The mechanical instrument used for continuous record of wind speed and wind direction at the observatory is _____
v. The distance between transmitter and receiver in Drishti Transmissometer is _____
vi. The typical frequency range used in the Microwave Radiometer is _____
vii. IMD is has _____ GUAN standard RS/RW stations.
viii. The intermediate frequency (IF) of the IMS radio theodolite is_____
ix. Pyranometer is used for measuring _____ and _____ solar radiation
x. Pyrheliometer is used for _____ solar radiation measurement.
xi. WRR stands for _____.
xii. The reference standard for solar radiation calibration is the _____ radiometer.

1. (B) Short Answer / True or False with justification: (Answer any 5) **(2 × 5 = 10 Marks)**

i. Pyrheliometer is the primary standard for global solar radiation. (True/False, justify)
ii. GPS Pilotsonde measure temperature and pressure. (True/False, justify)
iii. Landing is usually avoided when cross wind exceeds 45kts. (True/False, justify)
iv. UV-C radiation reaches the Earth's surface. (True/False, justify)
v. What are essential parts of self-recording instruments?
vi. Explain the basic principle on which Dyne's Pressure Tube Anemograph works.
vii. Explain the working principle of Bimetallic Thermograph.

AWS & ARG

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

i. Sensor used for temperature measurement in AWS is____.
ii. Total volume of water required for 1 tip in TBRG with collector diameter of 20cm is ____.
iii. TBRG is installed at a height of ____ meters above ground level.
iv. Wind sensor calibration is done using ____.
v. Antenna used for satellite uplink in AWS is ____.
vi. Use of GPS antenna in AWS is for ____.
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. What is the sampling interval of different meteorological parameters in AWS?
iii. What are different types of AWS?
iv. At what height are different sensors installed in AWS?
v. What will be the file name of GPRS based AWS data file based on following Metadata

a. Station id: **MEG2903A**, Date: **15 April 2025**, Type of Station: **02**, Time: **03 Hour 15 Minutes**

b. What is resolution of TBRG used in IMD? Calculate amount of water required for one tip of an IMD TBRG with 16 cm collector diameter.

vi. In an AWS satellite telemetry, Decode the values received against parameter mentioned:
- **a.** Temperature: 0365
- **b.** Rainfall :0710
- **c.** Wind Speed: 0059
- **d.** Pressure: 0170 with datum pressure of 0950 hPa

SATELLITE COMMUNICATION SYSTEM

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

i. Modulation Technique used in Imager and Sounder payloads of INSAT-3D/3DR satellite is ____ and ____ respectively.
ii. Encoding technique used in Imager and Sounder of INSAT 3D/3DR satellite is ____ and ____ respectively.
iii. Downlink frequency of Imager and Sounder payloads of INSAT 3D/3DR satellite is ____ and ____ respectively.
iv. Angle between orbital and equatorial plane is ____ for geostationary orbit.
v. The INSAT 3DR satellite is located at ____ °E.
vi. Eccentricity of a ____ orbit is zero.
vii. Transmission delay is least in _____ satellite communication system (GEO/LEO/MEO)
viii. Kepler's third law states that, the square of the periodic time of an elliptical orbit proportional to the cube of its _____
ix. DRT payload of INSAT-3D satellite is having uplink frequency _____and downlink frequency _____
x. GPS satellites carries Atomic Clock on board and transmit two low power radio signals L1=_____ and L2 =_____.
xi. Multipath effects are removed by _____Antenna.

3. (B) Short answer type questions: (Answer any 3) **(2 × 3 = 6 Marks)**

i. Define Free Space Path Loss.
ii. Define Uplink and Downlink in satellite.
iii. Write formula of Calculation of Uplink(C/No).
iv. What is the function of Antenna Control Unit (ACU) of earth station system/ground receiving system?

3. (C) Explain in brief: (Answer any 4) **(2.5 × 4 = 10 Marks)**

i. Draw a block diagram of earth station system/ground receiving system.
ii. Explain MMDRPS system, DR & DP
iii. Explain EIRP in Satellite communication system.
iv. Differentiate between active and passive sensors in remote sensing.
v. Explain atmospheric window with examples.

METEOROLOGICAL SATELLITE

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

i. ____ was the India's first exclusive communication satellite.
ii. The spectral band from ____ μm to ____ μm is known as the reflective region.
iii. ____ and ____ are the most common instrument in use, collecting reflected and emitted radiation in a wide range of frequencies.
iv. Transmission cost is independent of coverage area in (Satellite communication/ conventional terrestrial systems) ____ .
v. As the height of a satellite orbit gets lower, the speed of the satellite ____.
vi. INSAT 3D satellite is located at ____ °E.
vii. Low-orbit satellites get affected due to friction caused by collision with _____ and _____
viii. The resolution of INSAT 3R TIR1 imager channel is____.
ix. Full form of CrIS is ____.
x. The absorption band of Ozone is at ____.

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

i. Wien's Displacement Law states that radiation emitted by a black body is a function of wavelength (λ) and temperature (T).
ii. A polar orbit is an orbit in which a satellite passes above or nearly above the equator.
iii. INSAT 3D & 3DR satellites are operated in a staggered mode to receive data every half hourly.
iv. INSAT 3D Water vapour channel resolution is of 4 Km.
v. INSAT 3DR is the first Indian meteorological satellite to have Sounder.

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

i. Define Black Body.
ii. Write down the resolutions of the following imager channels from INSAT 3DR satellite:
    a. Visible b. MIR c. SWIR d. Water Vapour
iii. Write a short note on Rayleigh scattering.
iv. Write a short note on INSAT-3DR/3DS Data Relay Transponder.
v. Explain different types of meteorological satellites.
vi. Explain Satellite Aided Search & Rescue (SAS & R).

MARINE METEOROLOGICAL SERVICES

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

i. Coastal Sea Level is measured using ____.
ii. Wave height over oceans is measured in ____.
iii. Moored buoy data can't be used to monitor the cyclones. (True/False).
iv. The error in the cyclone landfall point was reduced due to installation of coastal AWS. (True/False)
v. Oil and gas exploration at sea is a near shore activity. (True/False)
vi. Long term monitoring and analysis of Marine weather data provides insights into climate change. (True/False)

RADIO REGULATION

6. (A) (Answer any 5) **(1 × 5 = 5 Marks)**

i. Define Frequency assignment.
ii. Define Frequency band allocation.
iii. Define Frequency allotment.
iv. NFAP stands for ____.
v. The bandwidth of 181.5 kHz is represented in the designation of emission as ____.
vi. The Ku-band radar operated in ____.

OZONE & AIR POLLUTION

7. (A) (Answer any 5) **(1 × 5 = 5 Marks)**

i. The Dobson spectrophotometer is primarily used for measuring surface ozone. (True/False)
ii. Ozone in the stratosphere protects life on Earth by absorbing harmful ultraviolet radiation. (True/False)
iii. Total Suspended Particulate Matter (TSPM) is measured using Dobson spectrophotometers. (True/ False)
iv. The _____ spectrophotometer is widely used by IMD for long-term monitoring of total ozone.
v. The pH of rainwater is measured using a _____
vi. Excessive release of carbon dioxide in the atmosphere is the cause of ____ effect which produces global warming.

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