PG/IVS/MTM/497(B)/25(Pr.)

M.Sc. 4th Semester Examination, 2025

APPLIED MATHEMATICS

(*Lab : Meteorology*)

[Practical]

PAPER – MTM-497B

Full Marks : 25

Time : 2 hours

Answer **one** question from each Group

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

The questions are to be selected by lottery

GROUP – A

1. Demonstrate Cup counter anemometer. Calculate the wind speed and wind direction near the science building taking a set of 3 data. 7

2. Demonstrate the Hygrometer. Find the potential temperature of the air near the science building measuring of wet and dry bulb temperatures taking a set of 3 data. 7

3. Demonstrate Sun shine recorder. Find the relative humidity near the science building taking a set of 3 data. 7

4. Demonstrate Rain gauge. Calculate the saturation vapor pressure near the science building taking a set of 3 data. 7

5. Demonstrate Aneroid barometer. Calculate the vapor pressure near the science building taking a set of 3 data. 7

6. Demonstrate Evaporimeter. Find the dew point temperature by measuring dry bulb and wet bulb temperature near the science building taking a set of 3 data. 7

7. Demonstrate Wind vane. Find the specific humidity of the air near the science building measuring of wet and dry bulb temperatures taking a set of 3 data. 7

8. Demonstrate Cup counter anemometer. Find the virtual temperature of the air near the science building measuring of wet and dry bulb temperatures taking a set of 3 data. 7

GROUP – B

9. Initially an air parcel having the temperature 20°C, mixing ratio 12 gm/kg, pressure 1000 mb, is being lifted dry adiabatically to the pressure level 90 kPa. What is the state of the air parcel initially and finally. (Using Tephigram) 4

10. What will be the height and pressure level of an air parcel initially having temperature 20°C, P=85 kPa, r=8 gm/kg. When it reaches at saturation level ? 4

11. Initially an air parcel T=20°C, P=800 mb, T_d=11°C. What is the state of air parcel when it reaches a pressure height of 40 kPa ? 4

12. Plot the air parcel having temperature 30°C, pressure 90 kPa at mixing ratio being 20 gm/kg, on the tephigram. Find the saturation mixing ratio and the actual mixing ratio, relative humidity of the air parcel. 4

13. Find the LCL and relative humidity of the following air parcel :

T=30°C, P=1050 mb, T_d=15°C 4

14. For the air parcel whose pressure is 85 kPa, temperature being 30°C and mixing ratio being 8 g/kg, using thermodynamic diagram, find its lifting condensation level, state of the air parcel when it reaches a pressure height of 75 kPa and how much liquid water has been condensed out at that height ? 4

(*Continued*)

15. Determine the new state of the air parcel having initial temperature = 25°C, mixing ratio = 12 gm/kg and pressure = 75 kPa after being lifted dry adiabatically to the pressure level 60 kPa. 4

16. For the air parcel whose pressure is 70 kPa, temperature being 25°C and mixing ratio being 12 g/kg, find its lifting condensation level, state of the air parcel when it reaches a pressure height of 60 kPa and how much liquid water has been condensed out at that height ? 4

17. For the air parcel whose pressure is 80 kPa, temperature being 25°C and mixing ratio being 10 g/kg, find its dew point, saturation mixing ratio and relative humidity from thermodynamic diagram. 4

GROUP – C

18. Plot the following data around a surface station model when the atmosphere has the following status : in present weather there is a thunderstorm, in past weather there was a moderate snow and the pressure tendency in last 3 hours is +0.3 mb, temperature being 35°C and wind blowing from south-east direction with speed 70 knots. 4

19. Plot the following data around a surface station model when the atmosphere has the following status : in present weather there is a thunderstorm, in past weather there was a heavy rain and the pressure tendency in last 3 hours is 0.3 mb, temperature being 25°C and wind blowing from north-west direction with speed 50 knots. 4

20. Plot the following data around a surface station model when the atmosphere have the

following : Temp 45°C, dewpoint 29°C, overcast, wind from SE at 25 knots, weather light rain, pressure 950.5 mb. 4

21. Plot the following data around a surface station model when the atmosphere has the following status : in present weather there is a heavy rain, in past weather there was a moderate rain and the pressure tendency in last 3 hours is -0.3 mb, temperature being 25°C and wind blowing from north-west direction with speed 55 knots. 4

22. Plot the following data around a surface station model when the atmosphere have the following : Temp 35°C, dewpoint 25°C, overcast, wind from SE at 2 knots, weather light rain, pressure 990.5 mb. 4

23. Plot the following data around a surface station model when the atmosphere has the following status : in present weather there is

a fog, in past weather there was a moderate snow and the pressure tendency in last 3 hours is +1.2 mb, temperature being 30°C and wind blowing from north-east direction with speed 75 knots. 4

24. Note Book + Viva - 5

25. Field visit - 5