E 6849 (Pages : 3) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2013

First Semester

Core Course—METHODOLOGY IN PHYSICS

(Common for B.Sc. Physics (Model I) ; (Model II) B.Sc. Physics—Electronic Equipment Maintenance and B.Sc. Physics—Instrumentation

[2013 Admissions]

Time : Three Hours Maximum : 60 Marks

Candidates can use Clark's tables and Scientific non-programmable calculators.

Part A

Very Short Answer Questions.
Answer **all** *questions briefly.*
Each question carries 1 *mark.*

1. Define Galilean transformation for velocity.
2. What is the role of GaAs technology in the semiconductor revolution ?
3. What is least count ? How it is determined ?
4. What is the principle of water clock ?
5. Why the internal resistance of voltmeter is very high and that of ammeter is very low ?
6. What is Intrinsic error ?
7. How can the parallax error be minimised ?
8. Define Calibration.

(8 × 1 = 8)

Part B

Brief Answer Questions.
Answer any **six** *questions.*
Each question carries 2 *marks.*

9. Show how mass of an object varies with velocity ?
10. State and explain Kepler's laws.
11. State and explain Chandrasekhar limit ?

Turn over

12. List and explain the features of nanotechnology ?

13. Explain the method of estimating the thickness of a paper using screw gauge.

14. Describe the method of angle measurement using spectrometer verniers.

15. With a block circuit diagram, explain the working principle of a digital multimeter.

16. Distinguish between precision, repeatability and reproducibility.

17. Define and differentiate between threshold and resolution, on the context of error ?

18. How do you proceed to determine percentage error in the result from known errors in the measurement variable ? Give an example.

(6 × 2 = 12)

Part C

Problems / Derivations.
Answer any **four** *questions.*
Each question carries 4 marks.

19. Two bodies A and B each of mass 1 kg are moving along X-axis with speeds 12 m/s and – 6 m/s in a frame of reference S. Assuming the collision to be elastic, calculate the speeds of the two bodies after collision.

20. Calculate the velocity of nuclear particles whose mean life time is 2.5×10^{-7} sec ? The proper life time is 2.5×10^{-8} sec ?

21. Describe the principle of working of the digital clock. Compare its performance with atomic clock.

22. With neat circuit diagram, explain how a galvanometer with R = 20 Ω and I_{sh} = 5 mA can be converted into a 5A ammeter ? Calculate the value of shunt resistance required, and the multiplying factor of the shunt.

23. A voltmeter is used to measure a known voltage of 75V. 40% of the readings are within 0.8 V of true value. Estimate the standard deviation for the meter and the probability of an error of 1.2 V.

24. The following readings are taken of a certain physical length with the help of a micrometer screw : 1.41, 1.45, 1.63, 1.54, 1.49, 1.51, 1.60, 1.55, 1.47, 1.65 mm. Assuming that only random errors are present, calculate the (a) Arithmetic mean ; (b) Average deviation ; (c) Standard deviation ; and (d) Variance.

(4 × 4 = 16)

Part D

Long Answer Questions.
Answer any **two** *questions.*
Each question carries 12 *marks.*

25. Explain the contributions by S.N. Bose and C.V. Raman towards Physics.

26. (a) What is the significance of a wave function ? What do you predict about the energy of a particle in a closed box from quantum theory ?

    (b) Comment on the Maxwell's contribution in the fields of Electricity and Magnetism.

27. With neat circuit diagrams, explain how a basic galvanometer can be used as a multirange multimeter, capable of measuring, voltages, currents and resistances in different ranges ?

28. Explain different types of errors, their sources and the methods to minimise such errors.

(2 × 12 = 24)