:5U116

Name: .....

Reg. No.: .....

FIRST SEMESTER DEGREE EXTERNAL EXAMINATION DEC/JAN 2015 -16

(2015 Admission)

CC15UPH1B01- METHODOLOGY OF SCIENCE AND PHYSICS (core)

Time: 3 Hours Max marks: 80

Section A (Answer all questions) **10 x 1 = 10**

1. ---------- is an example which is the scientific study of mental and behavioral processes of humans.
2. Who discovered neutron?
3. The rest mass of a photon is .....
4. ---------- explains the black body spectrum.
5. ---------- is an axial vector.
6. If the magnitude of resultant of two forces F each, acting at a point is F, then the angle between the forces is .....
7. A square matrix A is said to be singular, if .....

State whether the statement is true or false

8. Basic sciences are concerned with principles and facts.
9. The theory of gravitation is not a law.
10. If H is Hermitian then iH is skew Hermitian.

Section B – (Answer all questions in two or three sentences.) **7 x 2 = 14**

11. What is hypothesis?
12. What is White revolution?
13. What is metastable state?
14. What are the properties of a Zero vector.
15. Define the divergence of a vector field?
16. What is diagonal matrix?
17. State Stokes theorem.

Section C. (Answer any five questions in one paragraph) **5 x 4 =20**

18. State the postulates of special theory of relativity.
19. What is stimulated emission?
20. Discuss the significance of peer review.
21. What are Eigen values and Eigen vectors of a matrix?
22. What is Twin paradox?
23. Find the volume of a sphere of radius 'a' using spherical polar coordinates.
24. Prove that the diagonals of a parallelogram bisect each other.

Section D. (Answer any four problems.) **4 x 4**

25. The energy level difference between two laser levels is 0.2eV. Determine the wavelength of radiation.
26. Show that the area of an isosceles triangle is $\frac{1}{2}\bar{A}\,X\,\bar{B}$, where $\bar{A}$ and $\bar{B}$ are two sides of the triangle.
27. Find $\nabla.\bar{B}$ at the point (1,2,3), if $\bar{B} = 3x^2\hat{\imath}+8xy^2\hat{\jmath}+xyz^2\hat{k}$
28. If $\bar{A}=4\hat{\imath}-3\hat{\jmath}+2\hat{k}$ and $\bar{B}=2\hat{\imath}-4\hat{\jmath}+3\hat{k}$ and $\bar{C}=4\hat{\imath}-8\hat{\jmath}-2\hat{k}$ find $(\bar{A}X\bar{B})\ X\ \bar{C}$
29. If $|\overline{A}+\bar{B}| = |\overline{A}-\bar{B}|$, find the angle between $\overline{A}$ and $\bar{B}$
30. Using Cramer's rule, solve the system of equations

$$2x_1 - x_2 + 2x_3 = 4$$
$$x_1 + 10x_2 - 3x_3 = 6$$
$$-x_1 + x_2 + x_3 = -3$$

31. What are the predictions of General theory of relativity?

Section E (Answer any two) **2 x 1(**

32. What are the different steps involved in a scientific study? Explain.
33. Explain the following on the basis of relativity a) Time dilation
    b) Length contraction
34. What are the basic principles of matrices? With suitable examples explain addition, subtraction and scalar multiplication
35. What are Derivatives and Gradients? Explain their geometrical meanings.

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