B.Sc. 5th Semester (Honours) Examination, 2020–21

PHYSICS

Course ID: 52416   **Course Code: SHPHS/503/DSE – 1**

Course Title: Advanced Mathematical Physics

Time: 2 Hours   **Full Marks: 40**

The figures in the right hand side margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.

1. Answer *any five* of the following: **2×5=10**

(a) What do you mean by Einstein's Summation Convention? Give one utilization of it.

(b) What is conditional probability?

(c) What is vector triple product? Give one example of it?

(d) What do you mean by Divergence and Curl of Tensor fields?

(e) What is Quotient Law of tensors?

(f) What do you mean by Homomorphism and Isomorphism of group?

(g) What is Poisson's distribution in theory of Probability? How can you get it from Binomial distribution of Probability?

(h) Define Riemannian space.

2. Answer *any four* of the following: **5×4=20**

(a) What is Stress tensor? How does it appear? Give the mathematical presentation of Moment of Inertia tensor for rigid body rotation.

(b) How can you estimate the projection of one line on another line? What will be the condition for two lines to be coplanar?

(c) What do you mean by Normal and Conjugate subgroups? What is Completeness?

(d) What is Gaussian distribution as normal distribution in theory of Probability? What is unit normal distribution?

(e) A manufacturer produces airmail envelopes, whose weight is normal with mean $\mu = 1.95$ gm and standard deviation $\sigma = 0.05$ gm. The envelopes are sold in lots of 1000. How many envelopes in a lot will be heavier than 2 gm? Use the fact that $\frac{1}{\sqrt{2\pi}} \int_0^1 \exp(-x^2/2)dx = 0.3413$

(f) Obtain the metric for a two-dimensional plane in terms of cartesian coordinates.

(g) Show that in a cartesian coordinate system the contravariant and covariant components of a vector are identical.

3. Answer any one question: **10×1=10**

(a) i) What do you mean by symmetric and anti symmetric tensor?

    ii) What is Kronecker Delta? Is it a tensor?

    iii) What do you mean by the rank of a tensor? Explain it with suitable example.

    iv) State and explain generalized Hooke's law.

    v) What is Group? What do you mean by basis and dimension of a group?

                                         2+2+2+2+2=10

(b) What is binomial distribution? Find the probability distribution function of Binomial distribution. Hence find Gaussian distribution with proper condition.   2+3+5=10

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