

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: CS/ME

SEMESTER : V
SESSION : MO/2022

SUBJECT: PH303 ADVANCED MATHEMATICAL PHYSICS

TIME: 3:00 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
-

- Q1(a) When two vectors are called linearly independent? [2]
Q1(b) Explain the properties of a vector space by taking an example. [3]
Q1(c) Determine whether or not the vector belong to the subspace spanned by and [5]
- Q2(a) Explain Hermitian and Skew-Hermitian Matrices with suitable examples. [2]
Q2(b) Prove the following relation for three matrixes A, B and C of equal dimension. [3]
 $\text{Tr}(ABC)=\text{Tr}(BCA)=\text{Tr}(CAB)$
Q2(c) Find the LU decomposition of the following matrix. [5]
- Q3(a) By considering one example, explain whether we can define a matrix by the functions of a matrix. [2]
Q3(b) Find the eigen values and eigen vectors of the following matrix. [3]
A=
Q3(c) Prove that eigen vectors of a Hermitian matrix corresponding to two different eigen values are orthogonal. [5]
- Q4(a) What do you mean by a tensor? Is vector a tensor? [2]
Q4(b) Explain sum, difference and product of two tensors. [3]
Q4(c) Explain inverse transformation for a cartesian tensor of rank 2. [5]
- Q5(a) Define symmetric and anti-symmetric tensors. [2]
Q5(b) Explain whether you can define these for a tensor of rank 1. Give reason. [3]
Q5(c) If A_j^i is mixed tensor of rank 2 and B_m^{kl} is mixed tensor of rank 3, prove that $A_j^i B_m^{kl}$ is a mixed tensor of rank 3. [5]

:::::25/11/2022:::::M