Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number______________________________

Course____________________________ Semester____________________________

Paper Code _________________Paper Title __________________________________

Type of Exam: ______________________________ (Regular/Back/Improvement)

Important Instruction for students:

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1st page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. **(2019MBA15)** and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

B.Sc. PHYSICS/ B.Sc. CHEMISTRY
THIRD SEMESTER
VECTOR ANALYSIS
BSM-732

Duration : 1. 30 hrs. **Full Marks : 35**

(PART-A : Objective)

Time : 10 min. **Marks : 10**

Choose the correct answer from the following: ***1X10=10***

1. If two vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other, then:

a. $\vec{a}.\vec{b} \neq 0$
b. $\vec{a}.\vec{b} = 0$
c. $\vec{a} = 0, \vec{b} \neq 0$
d. $\vec{a}.\vec{b} = ab$ or $\vec{a}.\vec{b} = -ab$

2. If A and B are the points $(1,-2,4)$ and $(2,4,1)$ respectively, then $\vec{AB} = ?$

a. $\hat{i} + 6\hat{j} - 3\hat{k}$
b. $\hat{i} + 4\hat{j} + 3\hat{k}$
c. $\hat{i} - 4\hat{j} + 3\hat{k}$
d. $\hat{i} + 4\hat{j} - 4\hat{k}$

3. What is the value of $\bar{a} \times (\bar{b} \times \bar{c}) = ?$

a. $(\bar{a}.\bar{b})\bar{c} - (\bar{a}.\bar{c})\bar{b}$
b. $(\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\bar{c}$
c. $(\bar{a}.\bar{c})\bar{b} + (\bar{a}.\bar{b})\bar{c}$
d. $(\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\bar{c}$

4. What is the value of $\hat{i}.(\hat{i} \times \hat{j}) = ?$

a. -1
b. 1
c. 0
d. None of the above

5. If the following vectors are coplanar
$\bar{a} = \hat{i} - \hat{j} + \hat{k}, \bar{b} = 2\hat{i} + \hat{j} - \hat{k}, \bar{c} = x\hat{i} + \hat{j} + x\hat{k}$,then the value of x is:

a. 2
b. 1
c. 0
d. -1

6. Which of the following is correct?

a. $[\bar{a} \quad \bar{b} \quad \bar{c}] = -[\bar{a} \quad \bar{c} \quad \bar{b}]$
b. $[\bar{a} \quad \bar{b} \quad \bar{c}] = [\bar{a} \quad \bar{c} \quad \bar{b}]$
c. $[\bar{a} \quad \bar{c} \quad \bar{b}] = -[\bar{a} \quad \bar{b} \quad \bar{c}]$
d. $[\bar{a} \quad \bar{b} \quad \bar{c}] = \bar{a} \times (\bar{b} \times \bar{c})$

7. What is the value of $\hat{i} \times \hat{i} = ?$

a. 1
b. 0
c. -1
d. None of the above

8. The term $\bar{a}.(\bar{b}\times\bar{c})$ represents:

a. Geometrically the volume V of a rectangle with the three vectors as the coterminous edges

b. Geometrically the volume V of a square with the three vectors as the coterminous edges

c. Geometrically the volume V of a parallelepiped with the three vectors as the coterminous edges

d. Geometrically the volume V of a parallelogram with the three vectors as the coterminous edges

9. What is value of $\bar{a}\times\{\bar{a}\times(\bar{b}\times\bar{c})\}=?$

a. $(\bar{b}\times\bar{a})$

b. $(\bar{a}.a)$

c. $(\bar{b}\times\bar{a})a$

d. $(\bar{a}.a)(\bar{b}\times\bar{a})$

10. $\vec{a}\times(\vec{b}+\vec{c})+\vec{b}\times(\vec{c}+\vec{a})+\vec{c}\times(\vec{a}+\vec{b})=?$

a. 1

b. 0

c. -1

d. None of the above

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PART-B : Descriptive

Time : 1 hr. 20 mins. **Marks : 25**

[Answer question no.1 & any four (4) from the rest]

1. Write the difference between scalar triple product and vector triple product. Prove that the following vectors are non-coplanar, if $\vec{a}$, $\vec{b}$ and $\vec{c}$ be non zero and non co planar vectors, 1+4=5

$$\vec{p} = 2\vec{a} - \vec{b} + 3\vec{c},\quad \vec{q} = \vec{a} + \vec{b} - 2\vec{c},\quad \vec{r} = \vec{a} + \vec{b} - 2\vec{c}$$

2. What do you mean by continuity and differentiability of a vector? If $R(u) = x(u)i + y(u)j + z(u)k$,where x , y , z are differentiable functions cof a scalar u, Prove that 1+4=5

$$\frac{dR}{du} = \frac{dx}{du}i + \frac{dy}{du}j + \frac{dz}{du}k$$

3. Given $R = \sin ti + \cos tj + tk$, find (a) $\frac{dR}{dt}$ (b) $\frac{d^2R}{dt^2}$ (c) $\left|\frac{dR}{dt}\right|$ (d) $\left|\frac{d^2R}{dt^2}\right|$? What is space curve? 1+4=5

4. Find the value of: 2+3=5

$$If\, a\hat{i} + 2\hat{j} = 3\hat{i} + 2\hat{j} - b\hat{k},\ find\, a, b$$

$$(ii) \left|\left(2\hat{i} - 3\hat{j}\right) \times \hat{i}\right|$$

5. Write the definition of Gradient, Curl and Divergence of a vector? If $\phi(x, y, z) = 3x^2y - y^3z^2$, find $\nabla\phi$ (or grad ϕ) at the $(1,-2,-1)$ point 3+2=5

6. Solve: $\vec{a} \times \left(\vec{b} + \vec{c}\right) + \vec{b} \times \left(\vec{c} + \vec{a}\right) + \vec{c} \times \left(\vec{a} + \vec{b}\right) = 0$ 2+3=5

(a) $\int R(u)du$ (b) $\int_1^2 R(u)du$

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