6/10/2017

VCD F.Y. B.Sc.ATKT PHYSICS-I SEM-I 2017-18 75 MARKS 2 1/2HRS.

Note: i) All the questions are compulsory.

ii) Figures to the right indicate full marks.

iii) Use of non programmable calculator is allowed.

Q.1 A) Attempt any one. [8 M]

a) If $\bar{A} = \bar{i} + 3\bar{j} - 2\bar{k}$, $\bar{B} = 4\bar{i} - 2\bar{j} + 4k$.

Find a) $(\bar{A}.\bar{B})$ b) A c) B d) $3\bar{A} + .2\bar{B}$

b) Define vector differential operator del. define gradient .Explain the term directional derivative of in the direction $\bar{a}$.

Q.1 B) Attempt any one. [7 M]

a) If $\bar{A} = 2\bar{i} - 3\bar{j} - \bar{k}$, $\bar{B} = \bar{i} + 4\bar{j} - 2\bar{k}$, find a) $\bar{A}X\bar{B}$ .b) $\bar{B}X\bar{A}$ c) $(\bar{A}+\bar{B}) + (\bar{A}-\bar{B})$

b) Find the angle between the surface $x^2+y^2+z^2$ and $x^2+y-z=3$ at the point (2,-1,2).

Q.1 C) Attempt any one. [5 M]

a) Find the area of traingle having vertices A (1.3.2) .B (2.-1.1) and C (-1.2.3).

b) If $\bar{A} = 3y^2x - y^2z^2$, find the grad $\bar{A}$ at the a point (1,-1,2).

Q.2 A) Attempt any one. [8 M]

-a) the emf equation for the discharging of a capacitor through a resistance is

$R\frac{dq}{dt} + \frac{q}{c} = 0$

if initial charge on the capacitor is q_m, derive an expression for q.

b) A body start from rest and falls under gravity in a resisitive medium.If we assume that the resisitance force is propotional to the velocity ,its equation of motion is $\frac{dv}{dt} + bv = g$

Q.2 B) Attempt any one. [7 M]

a) Solve the equation $\frac{dy}{dx} - \frac{y}{x+3} = \frac{2}{x+3}$

b) $(4x^3+6xy+y^2)\,dx + (3x^2+2xy+2)dy = 0$

i) Is this equation is exact differential equation. if so find solution.

Q.2 C) Attempt any one. [5 M]

a) Solve D.E. $\frac{d2y}{dx2}-3\frac{dy}{dx}+2y=0$

b) solve a function F(x,y) is given by $F(x,y) = x^4+3x^2y+xy^2$. Is dF a perfect differential?

Q.3 A) Attempt any one. [8 M]

a) A block of mass m is placed on top of another of mass M>m .Assume that there is no friction beteen the bolcks of mass M and the surface on which it rests.The coefficient of satatic friction between the blocks μ.Show that the minimum force that may be applied to the blocj Mto slide the system and still keep the blocks togetger is $F=\mu g(m+M)$ .What will this force be if it is applied to the upper blocks of maa m?

b) Show that for a homogeneous isotropic material $Y= 3K(1-2\sigma)$.

Q.3 B) Attempt any one. [7 M]

a) Explain the three laws of Newton with example. What is friction ?Give the laws of friction.

b) For the liquid will flowing through pipe of variable cross sectional area, show that the velocity of flow at a section varies inversly area of cross section of section.

Q.3 C) Attempt any one. [5 M]

a) For a steel material, $Y=2x10^{11}$ N/m^2 and bluk modulus is $1.33x\ 10^{10}$ N/m^2.calculate Poisson's ratio and modulus of rigidity of steel.

b) An elevator is moving upward with the acceleration of 2.5 m/s^2 .A person of mass 70 kg is standing in elavator .What would be its weight on the scale fixed up on thje floor of the elevator.

Q.4) Attempt any three. [15 M]

a) Find m so that the vectors $2\bar{i}+3\bar{j}+4\bar{k}$,$7\bar{i}+-8\bar{j}+9\bar{k}$ and $m\bar{i}+20\bar{j}+5\bar{k}$ are coplaner.

b) Find the unit noraml to the surface $y^2+z^2=x^2$ at a point (1,2,3) .

c) solve the following $\frac{dN}{dt}= -\lambda N$

d)solve the D.E. is exact equation or not

$(4x^3 + 6xy+y^2)\,dx + (3x^2+2xy+2)dy=0$

e) A cricket ball of mass 350 g is moving with a velocity of 14 m/s and is hit by abat so that the ball is turned back with a velocity of 24m/s. The force of the body of the blow acts for 0.035 s. \find the average force exterted on the ball by the bat.

f) calculate the dimension and unit of stess,strain & modulus of elasticity .

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