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MATDIP401

Fourth Semester B.E. Degree Examination, June/July 2015
Advanced Mathematics - II

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Find the angle between 2 diagonals of a cube. **(06 Marks)**

b. If A(0 9 6), B(1 2 3) , C(7 - 25) are vertices of a triangle. Find the coordinates of the foot of the perpendicular drawn from A to BC. **(07 Marks)**

c. Find the equation of the plane in the Intercept form $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$. **(07 Marks)**

2 a. Find the equation of the plane passing through the three points (2, 3, 4) , (-3, 5, 1) (4, -1, 2). **(06 Marks)**

b. Find the equation of the plane through the points (1, 2, -1) and perpendicular to the planes $x + y - 2z = 5$ and $3x - y + 4z = 12$. **(07 Marks)**

c. Find the equation of the plane through the points (-1, 2, 0) and containing the plane $2x + 3y + 5z - 1 = 0$ and $3x + y - z + 2 = 0$. **(07 Marks)**

3 a. Find the unit vector parallel to the sum of the vector $\vec{A} = 2i + 4j - 5k$ and $\vec{B} = i + 2j + 3k$. **(06 Marks)**

b. Determine λ such that $\vec{A} = i + j + k$, $\vec{B} = 2i - 4k$. $\vec{C} = i + \lambda j + 3k$ are coplanar. **(07 Marks)**

c. Prove that $(\vec{a}\times\vec{b})\times\vec{c} = (\vec{a}.\vec{c})\,\vec{b} - (\vec{b}.\vec{c})\,\vec{a}$. **(07 Marks)**

4 a. Prove that $\frac{d}{dt}[\vec{F}.\vec{G}] = \vec{F}.\frac{d\vec{G}}{dt}+\frac{d\vec{F}}{dt}.\vec{G}$. **(06 Marks)**

b. Find the velocity and acceleration for the curve $\vec{r} = (1-t^3)\,i + (1+t^2)j + (2t - 5)k$ at $t = 1$ and also find their magnitude. **(07 Marks)**

c. If $\frac{d\vec{a}}{dt} = \vec{w}\times\vec{a}$ and $\frac{d\vec{b}}{dt} = \vec{w}\times\vec{b}$ then show that $\frac{d}{dt}[\vec{a}\times\vec{b}] = \vec{w}\times(\vec{a}\times\vec{b})$. **(07 Marks)**

5 a. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at (1, -2, -1) along $2i - j - 2k$. **(06 Marks)**

b. If $\vec{F} = (x + y + 1)\,i + j - (x + y)k$. Find $\vec{F}.\text{curl}\,\vec{F}$. **(07 Marks)**

c. Show that $\nabla.(\nabla\times\vec{A}) = 0$. **(07 Marks)**

6 a. Find L f(t) given that $f(t) = \begin{cases} t\ ; & 0 < t < 4 \\ 5\ ; & t > 4 \end{cases}$ **(05 Marks)**

b. Find i) $L[e^{3t}\sin 5t\ \sin 3t]$ ii) $L[t^5\cosh 3t]$ iii) $L[t^3 e^{-3t}]$. **(15 Marks)**

7 a. Find $L\left[\frac{1-e^t}{t}\right]$. **(05 Marks)**

b. Find i) $L^{-1}\left[\frac{4s+5}{(s-1)^2(s+2)}\right]$ ii) $L^{-1}\left[\frac{4s+15}{16s^2-25}\right]$ iii) $L^{-1}\left[\frac{s}{s^2-6s+9}\right]$. **(15 Marks)**

8 a. Using Laplace transform solve :

$$\frac{dzy}{dt^2} + 4\frac{dy}{dt} + 3y = e^t \quad ; \quad y(0) = 0 \quad y'(0) = 1.$$ **(10 Marks)**

b. Solve using Laplace transformation method

$y'' + 2y' - 3y = \sin t, \quad y(0) = y'(0) = 0.$ **(10 Marks)**

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