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Fourth Semester B.E. Degree Examination, July/August 2022  
Advanced Mathematics – II

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1
  - a. Find the distance between the points A(1, 1, 1) and B(2, 3, 5). (06 Marks)
  - b. Find the angle between the lines whose direction cosines are proportional to 1, 2, 4 and -2, 1, 5. (06 Marks)
  - c. If  $l, m, n$  are the direction of cosines of a line then prove that  $l^2 + m^2 + n^2 = 1$ . (08 Marks)
  
- 2
  - a. Find the equation of the plane passing through the points (3, -3, 1) and parallel to the plane  $2x + 3y + 5z + 6 = 0$ . (06 Marks)
  - b. Find the equation of the plane which passes through the points A(0, 1, 1), B(1, 1, 2) and C(-1, 2, -2). (06 Marks)
  - c. Show that points (2, 2, 0), (4, 5, 1), (3, 9, 4) and (0, -1, -1) are coplanar. (08 Marks)
  
- 3
  - a. If  $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ ,  $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$  and  $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$ . Find  $2\vec{a} + 3\vec{b} - 2\vec{c}$ . (06 Marks)
  - b. If  $\vec{a} = (3, -1, 4)$ ,  $\vec{b} = (1, 2, 3)$  and  $\vec{c} = (4, 2, -1)$  find  $\vec{a} \times (\vec{b} \times \vec{c})$  (06 Marks)
  - c. Prove that  $[\vec{a} + \vec{b}, \vec{b} + \vec{c}, \vec{c} + \vec{a}] = 2[\vec{a}, \vec{b}, \vec{c}]$  (08 Marks)
  
- 4
  - a. A particle moves along the curve  $\vec{r} = (1 - t^3)\hat{i} + (1 + t^2)\hat{j} + (2t - 5)\hat{k}$ . Determine its velocity and acceleration. (06 Marks)
  - b. If  $\vec{F} = (3xz - 3yz)\hat{i} + (3y^2 - 3xz)\hat{j} + (3z^3 - 3xy)\hat{k}$ , find  $\text{div } \vec{F}$ . (06 Marks)
  - c. Find  $\text{Curl } \vec{F}$ , whose  $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ . (08 Marks)
  
- 5
  - a. A particle moves along the curve  $\vec{r} = \cos 2t\hat{i} + \sin 2t\hat{j} + t\hat{k}$ . Find its velocity and acceleration. (06 Marks)
  - b. Find the divergence of the vector  $\vec{V} = xyz\hat{i} + 3x^2y\hat{j} + (xz^2 - y^2z)\hat{k}$  (06 Marks)
  - c. If  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ , show that  $\text{Curl } \vec{r} = 0$ . (08 Marks)
  
- 6
  - a. Find the Laplace transform of  $5\sin 2t + 3\cos 4t$ . (06 Marks)
  - b. Find the Laplace transform of  $\cos^2 2t$ . (06 Marks)
  - c. Find the Laplace transform of
    - i)  $\sin 4t + e^{-3t}$
    - ii)  $\cosh 2t + 2$ . (08 Marks)

- 7 a. Find Laplace transform of  $t \cos at$ . (06 Marks)  
b. Find the Laplace transform of  $e^{-2t}[2 \cos 5t - \sin 5t]$ . (06 Marks)  
c. Find the inverse Laplace transform of  $\frac{1}{s+2} + \frac{3}{2s+5} - \frac{4}{3s-2}$ . (08 Marks)
- 8 a. Solve  $\frac{d^2y}{dx^2} + 4 \frac{dy}{dx} + 3y = e^{-x}$  with  $y(0) = y'(0) = 1$ , by using Laplace transform method. (06 Marks)  
b. Find  $L^{-1}\left[\frac{1}{s(s^2 + a^2)}\right]$  by using convolution theorem. (06 Marks)  
c. Find the inverse Laplace transform of  $\frac{1}{(s+1)(s-2)}$ . (08 Marks)

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