Dumkal College

U.G. 1^{st} Semester Internal Examination-2021

MATHEMATICS
[HONOURS]
Course Code: MATH(H)CC-T-1 & MATH(H)CC-T-2

Full Marks: 10+10 Time: 1 Hour

The figures in the right- hand margin indicate marks.
Symbols have their usual meaning.

After completion send answer scripts in two separate pdf files with file name indicating paper name to the WhatsApp 9734394308 **within 30 minutes.**

MATH(H)CC-T-1

1. Answer any **five** questions: $5 \times 2 = 10$

   (a) Find order and degree of the differential equation $k(\frac{dy}{dx}) = \left\{1 + (\frac{dy}{dx})^2\right\}^{\frac{3}{2}}$.

   (b) Find the differential equation of all circles of radious c and centre (a, b).

   (c) Solve: $ydx - xdy + (1 + x^2)dx + x^2 \sin ydy = 0$.

   (d) Find the angle through which the axes must be turned so that the equation $lx - my + n = 0(m \neq 0)$ may reduced to the form $ax + b = 0$.

   (e) For which value of λ the equation $x^2 + \lambda xy - 2y^2 + 3y - 1 = 0$ represent a pair of straight lines.

   (f) Show that $\int_0^{\frac{\pi}{2}} \sin^7 xdx = \frac{16}{35}$.

   (g) Obtain reduction formula for $\int_{\frac{\pi}{2}}^{\frac{\pi}{4}} \cot^n xdx$, n being a positive integer greater than 1.

MATH(H)CC-T-2

1. Answer any **five** questions: $5 \times 2 = 10$

   (a) If $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$. Find the rank of the matrix $A^2 + A$.

   (b) Use Cayley-Hamilton theorem to find A^{-1} where $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$.

   (c) Find the eigen values of the matrix
   $\begin{pmatrix} 1 & -1 & 0 \\ 1 & 2 & -1 \\ 3 & 2 & -1 \end{pmatrix}$.

   (d) Show that the set of vectors $\{(1,2,3),(2,3,1),(3,1,2)\}$ are linearly independent in $\mathbb{R}^3$.

   (e) For any two complex numbers z_1 and z_2 show that
   $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2(|z_1|^2 + |z_2|^2)$.

   (f) Express $-1 + \sqrt{3}i$ in polar form.

   (g) Use De Moivre's Theorem to write $(1 - i)^8$ in a certesian form.

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