National Institute of Technology Hamirpur(H.P.)

End Term Examination (June 2021)

[Class: B.Tech. (II Semester)]

Title of Course: Engineering Mathematics-II

Course Code: MA-121

Time: Two hours **Maximum Marks: 50**

Note: All questions are compulsory.

Q1 Solve:

$$p^2(x-2)+p(2y-2xy-x+2)+y^2+y=0$$

(5 marks)

Q2 Solve the following simultaneous equations: (5 marks)

$$\frac{dx}{dt}+2\frac{dy}{dt}-2x+2y=3e^t$$

and

$$3\frac{dx}{dt}+\frac{dy}{dt}+2x+y=4e^{2t}$$

given that $x=0, y=0, \frac{dy}{dt}=2, \frac{dx}{dt}=3$ when $t=0$.

Q3 Find the complete integral of

$$2(pq+yp+qx)+x^2+y^2=0$$

(5 marks)

Q4 Solve:

$$\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial x\partial y}+3\frac{\partial^2 z}{\partial y^2}=\sqrt{x+3y}$$

(5 marks)

Q5 Find the Laplace transform of

$$\int_t^\infty \frac{cosx}{x}dx$$

(5 marks)

Q6 Solve the differential equation

$$2\frac{d^2y}{dt^2}+\frac{dy}{dt}+2y=H(t-5)-H(t-20),$$

where $H(t-5)$ and $H(t-20)$ are unit step functions and $y(0)=0, \frac{dy}{dt}(0)=0$ (5 marks)

Q7 Find the Fourier transform of

$$f(x)=\frac{1}{\sqrt{x}}$$

(5 marks)

Q8 Using inverse Z-transform, find $h(n)$, where

$$H(z) = \frac{1 + 2z^{-1} - 5z^{-2} + 6z^{-3}}{1 - 3z^{-1} + 2z^{-2}}, \quad |z| > 2.$$

(5 marks)

Q9 If X and Y are two events such that probability of X is $\frac{1}{2}$, probability of Y is k, probability of occurrence of at least of one of the two events X and Y is $\frac{4}{5}$. For what value of k (i) X and Y are disjoint (ii) X and Y are independent (5 marks)

Q10 The probability distribution of random variable X is $f(x) = ksin\frac{\pi x}{5}, 0 \leq x \leq 5$. Determine the constant k. Also check whether the given function satisfies the conditions of being a probability density function. (5 marks)

****End of the paper****

*********Best of Luck, Be Honest*********