Sheet No. 1

Roll No......................

NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

B. Tech. (Semester – II) Theory Examination, Dec.-2019

Subject: Mathematics- II

Paper Code: MAT- 106T/ MAT-104 (Old Scheme, Prior to July 2017)

Time: 03 Hours **Max. Marks: 50**

Note:

I. Answer **FIVE** questions out of the following NINE questions, selecting **at least one**question from each part. Marks allotted for each question are shown on the right hand margin.

II. Thecandidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of **right course code** and the **right subject title**.

III. Unless stated otherwise, the symbols have their usual meanings in context with the subject.

	PART-A	
1	**(a)** Solve:$x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+5y=x^2\sin(\log x)$. **(b)** State and prove the generating function for the Bessel's function $J_n(x)$.	[5] [5]
2	Solve the following equation in series neaı x=0: $$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-1)y=0.$$	[10]
3	**(a)** Prove that (i)$x\,J'_n=n\,J_n-x\,J_{n+1}$. (ii) $x\,J'_n=-n\,J_n+x\,J_{n-1}$. **(b)** Solve the differential equation; $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=e^{-x}\log x$. by method of variation of parameters.	[2.5] [2.5] [5]

Contd.

PART-B		
4	(a) Solve: $px(x+y) = qy(x+y) - (2x+2y+z)(x-y)$. (b) Solve completely the equation: $(x+pz)^2 + (y+qz))^2 = 1$.	[5] [5]
5	(a) Solve:$(D^2 + 5DD' + 6D'^2)z = \frac{1}{y-2x}$. (b) Solve the partial differential equation $$(D^2 - DD' + D' - 1)z = \cos(x+2y) + e^y.$$	[5] [5]
6	(a) Find $L^{-1}[\tan^{-1}\frac{2}{s^2}]$. (b) Solve the equation $y''' + 2y'' - y' - 2y = 0$, by using Laplace transform given that $y(0) = y'(0) = 0$ and $y''(0) = 6$.	[5] [5]
7	(a) Solve $(D^2 + D\,D' - 6\,D'^2)z = 2y\cos x$. (b) By using Convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+4)(s^2+9)}\right]$.	[5] [5]
PART-C		
8	(a) Find by double integration, the area lying between the curves $y = 4x - x^2$ and $y = x$. (b) By changing in to polar co-ordinates, evaluate: $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dy\,dx$.	[5] [5]
9	(a) Evaluate $\iint_R (x+y)^2\, dx\,dy$, where R is the parallelogram in the xy - plane with vertices (1, 0), (3, 1), (2, 2) and (0, 1) using the transformation $u = x + y$ and $v = x - 2y$. (b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\; dx\,dy\,dz$.	[5] [5]

THE END