Roll No. ....

TMA–201

B. TECH. (SECOND SEMESTER)

END SEMESTER EXAMINATION, 2019

(ALL BRANCHES)

ENGINEERING MATHEMATICS—II

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions and all questions are compulsory.

(ii) Attempt any *two* parts from each question.

(iii) All questions carry equal marks.

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Define linear differential equation. Solve :

$$(D^2+2)\,y = e^x \cos x + x^2 e^{2x}.$$

(b) Use method of Variation of parameter to solve :

$$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x.$$

(c) Solve :

$$\frac{d^4y}{dx^4} - y = \cos x \cosh x .$$

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) State Convolution Theorem and use it to evaluate :

$$L^{-1}\left[\frac{s^2}{(s^2+a^2)^2}\right].$$

(b) Using Laplace transformation, solve the differential equation :

$$(D^2+9)\,y = \cos 2x, \text{ if } y(0)=1,\; y\left(\frac{\pi}{2}\right) = -1.$$

(c) Find the Laplace transform of the following periodic function :

F $(t) = t/T$, $0 < t < T$ (saw-tooth wave of period T).

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Define partial differential equations. Solve :

$$4r - 4s + t = 16 \log (x + 2y).$$

(b) Solve by the method of separation of variables :

$$\frac{\partial u}{\partial x} = 5\frac{\partial u}{\partial t} + u, \text{ where } u(x, 0) = 6\,e^{-3x}.$$

(c) Solve the partial differential equation :

$$\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = (x + y).$$

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the Half Range Fourier cosine series of :

$$f(x) = |\cos x|, \; 0 < x < \pi.$$

(b) Obtain Fourier series for the function :

$$f(x) = \begin{cases} 1 + x, & -\pi < x < 0 \\ 1 - x, & 0 < x < \pi \end{cases}$$

(c) Find the Fourier series expansion for the function :

$$f(x) = \frac{(\pi - x)^2}{4}, \; 0 < x < 2\pi.$$

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Define Bessel's differential equation. Show that :

$$\frac{d}{dx}\left\{x^n J_n(x)\right\} = x^n J_{n-1}(x).$$

(b) Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, subject to the boundary conditions $u(0, t) = 0$, $u(l, t) = 0$ $(t > 0)$ and initial condition $u(x, 0) = x$, l being the length of the bar.

(c) Prove that :

$$\int_{-1}^{1} [P_n(x)]^2 \, dx = \frac{2}{2n+1}.$$