

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (OLD) EXAMINATION – WINTER 2018

Subject Code:130002

Date:17/11/2018

Subject Name:Advanced Engineering Mathematics

Time:10:30 AM TO 01:30 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) (i) Solve: $\left(x \tan \frac{y}{x} - y \sec^2 \frac{y}{x}\right) dx + x \sec^2 \frac{y}{x} dy = 0$ **04**
- (ii) Find Laplace transform of $\frac{(\cos at - \cos bt)}{t}$ **03**
- (b) (i) Solve: $\frac{dy}{dx} + \frac{x}{1-x^2} y = x\sqrt{y}$. **04**
- (ii) Find Inverse Laplace transform of $\frac{3(s^2-1)^2}{s^5}$ **03**
- Q.2** (a) (i) Find Half-Range cosine series for $f(x) = 1; 0 \leq x \leq 1.$ **04**
 $= x; 1 \leq x \leq 2.$
- (ii) Solve: $(y^2 - x^2) dy + (x^2 - y^2) dx = 0$ **03**
- (b) Obtain Fourier series for $f(x) = x - x^2; -1 < x < 1$ **07**
- OR**
- (b) Find series solution of $\frac{d^2 y}{dx^2} + x^2 \frac{dy}{dx} = 0.$ **07**
- Q.3** (a) (i) Solve $(2xy + y - \tan y) dx + (x^2 - x \tan^2 y + \sec^2 y) dy = 0.$ **04**
- (ii) Solve: $(2xy + y - \tan y) dx + (x^2 - x \tan^2 y + \sec^2 y) dy = 0.$ **03**
- (b) Obtain Fourier series for $f(x) = |\sin x|; -\pi < x < \pi.$ **07**
- OR**
- Q.3** (a) (i) Define periodic function. Find Laplace transform of $f(t) = t^2; 0 \leq t \leq 2$ $f(t+2) = f(t).$ **04**
- (ii) Solve: $(x^2 - 1) \frac{dy}{dx} + 2xy = 1.$ **03**
- (b) State Convolution theorem. Use it find Inverse Laplace transform of $\frac{s}{(s^2 + a^2)(s^2 + b^2)}$ **07**
- Q.4** (a) (i) Solve: $\frac{d^4 x}{dt^4} + 4x = 0.$ **04**
- (ii) Evaluate: Prove that $\int_0^\infty \frac{e^{-at} - e^{-bt}}{t} dt = \ln\left(\frac{b}{a}\right).$ **03**
- (b) (i) Solve $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ using method of separable variable method. **04**
- (ii) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ **03**

OR

- Q.4 (a)** (i) Solve: $\frac{d^3y}{dt^3} - 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} - 6y = 0$. **04**
- (ii) Find Inverse Laplace transform of $\frac{5s^2 - 2s - 19}{(s+3)(s-1)^2}$ **03**
- (b)** Find series solution of $(1+x^2)y'' + xy' - y = 0$. **07**
- Q.5 (a)** (i) Express the function $f(x) = \begin{cases} 1 & : -1 \leq x \leq 1 \\ 0 & : \text{Otherwise} \end{cases}$ as Fourier integral. **05**
- (ii) Define Dirac-Delta function **02**
- (b)** Find solution of $y'' - 2y' + 2y = e^x \tan x$ using method of variation of parameter. **07**
- OR**
- Q.5 (a)** (i) Solve: $(x^2D^2 + 4xD + 2)y = x + \log x$. **05**
- (ii) Define Gamma function and find its value for $3/2$. **02**
- (b)** Find solution of $(D^2 + D)y = x^2 + 2x + 4$, using method of undetermined coefficient **07**
