

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III(New) EXAMINATION – SUMMER 2016

Subject Code: 2130002

Date: 07/06/2016

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 Answer the following one mark each questions : 14

- 1 Integrating factor of the differential equation
 $\frac{dx}{dy} + \frac{3x}{y} = \frac{1}{y^2}$ is _____
- 2 The general solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = \tan 2x$ _____.
- 3 The orthogonal trajectory of the family of curve $x^2 + y^2 = c^2$ is _____
- 4 Particular integral of $(D^2 + 4)y = \cos 2x$ is _____
- 5 $X=0$ is a regular singular point of
 $2x^2y'' + 3xy'(x^2 - 4)y = 0$ say true or false.
- 6 The solution of
 $(y - z)p + (z - x)q = x - y$ is _____
- 7 State the type, order and degree of differential equation
 $\left(\frac{dx}{dy}\right)^2 + 5y^{\frac{1}{3}} = x$ is _____
- 8 Solve $(D+D^4)z = \cos x$
- 9 Is the partial differential equation
 $2\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} + 3\frac{\partial^2 u}{\partial y^2} = 6$ elliptic?
- 10 $L^{-1}\left(\frac{1}{(s+a)^2}\right) =$ _____
- 11 If $f(t)$ is a periodic function with period t then
 $L[f(t)] =$ _____
- 12 Laplace transform of $f(t)$ is defined for +ve and -ve values of t . Say true or false.
- 13 State Duplication (Legendre) formula.
- 14 Find $B\left(\frac{9}{2}, \frac{7}{2}\right)$

Q.2 (a) Solve : $9y' + 4x = 0$

03

(b) Solve : $\frac{dy}{dx} + y \cot x = 2 \cos x$ 04

(c) Find series solution of $y'' + xy = 0$ 07

OR

(c) Determine the value of (a) $J_{\frac{1}{2}}^1(x)$ (b) $J_{\frac{3}{2}}^1(x)$ 07

Q.3 (a) Solve $(D^2 + 9)y = 2\sin 3x + \cos 3x$ 03

(b) Solve $y'' + 4y' = 8x^2$ by the method of undetermined coefficients. 04

(c) (i) Solve $x^2p + y^2q = z^2$ 07

(ii) Solve by charpit's method $px+qy = pq$

OR

Q.3 (a) Solve $y'' + 4y' + 4 = 0$, $y(0) = 1$, $y'(0) = 1$ 03

(b) Find the solution of $y'' + a^2y' = \tan ax$, by the method of variation of parameters. 04

(c) Solve the equation $u_x = 2u_t + u$ given $u(x,0) = 4e^{-4x}$ by the method of separation of variable. 07

Q.4 (a) Find the fourier transform of the function $f(x) = e^{-ax^2}$ 03

(b) Obtain fourier series to represent $f(x) = x^2$ in the interval 04

$-\pi < x < \pi$. Deduce that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$

(c) Find Half-Range cosine series for 07

$F(x) = kx$, $0 \leq x \leq \frac{l}{2}$

$= k(l-x)$, $\frac{l}{2} \leq x \leq l$

Also prove that $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$

OR

Q.4 (a) Express the function 03

$F(x) = 2$, $|x| < 2$

$= 0$, $|x| > 2$ as Fourier integral.

(b) Find the fourier series expansion of the function 04

$F(x) = -\pi$ $-\pi < x < 0$

$= x$ $0 < x < \pi$

(c) Find fourier series to represent the function 07

$F(x) = 2x - x^2$ in $0 < x < 3$

Q.5 (a) Find $L^{-1} \left\{ \frac{1}{(s+\sqrt{2})(s-\sqrt{3})} \right\}$ 03

(b) Find the laplace transform of 04

(i) $\frac{\cos at - \cos bt}{t}$

(ii) $t \sin at$

(c) State convolution theorem and use to it evaluate 07

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

OR

- Q.5 (a) $L\{t^2 \cos h3t\}$ 03
- (b) Find $L^{-1}\left\{\frac{1}{s^4-81}\right\}$ 04
- (c) Solve the equation $y'' - 3y' + 2y = 4t + e^{3t}$, when $y(0)=1, y'(0) = -1$ 07

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