

CENTRAL LIBRARY 15MAT21

USN

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020 **Engineering Mathematics – II**

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

a. Solve $\frac{dy^2}{dx^2} - 4y = \cosh(2x - 1) + 3^x$ by inverse differential operators method. (06 Marks)

Solve $(D^3 - 1)y = 3 \cos 2x$ by inverse differential operators method. (05 Marks)

Solve $(D^2 + a^2)$ y = Sec (ax) by the method of variation of parameters. (05 Marks)

Solve $(D^2 - 2D + 5) y = e^{2x} \sin x$ by inverse differential operator method. (06 Marks)

Solve $(D^3 + D^2 + 4D + 4)$ $y = x^2 - 4x - 6$ by inverse differential operator method. (05 Marks)

c. Solve $y'' - 2y' + 3y = x^2 - \cos x$ by the method of undetermined coefficients. (05 Marks)

Solve $x^3y''' + 3x^2y'' + xy' + 8y = 65 \cos(\log x)$

Solve $xy\left(\frac{dy}{dx}\right)^2 - (x^2 + y^2)\frac{dy}{dx} + xy = 0$ (05 Marks)

Solve the equation (px - y) (py + x) = 2p by reducing into Clairaut's form taking the substitution $X = x^2$, $Y = y^2$. (05 Marks)

Solve $(2x-1)^2y'' + (2x-1)y' - 2y = 8x^2 - 2x + 3$

(06 Marks)

(06 Marks)

Solve $y = 2px + p^2y$ by solving for 'x'.

(05 Marks)

Find the general and singular solution of equation $xp^2 - py + kp + a = 0$.

(05 Marks)

Module-3

Obtain partial differential equation by eliminating arbitrary function.

Given $z = y^2 + 2f \left(\frac{1}{z} + \log y \right)$

(06 Marks)

Solve $\frac{\partial^2 u}{\partial x \partial t} = e^{-t} \cos x$, given that u = 0 when t = 0 and $\frac{\partial u}{\partial t} = 0$ at x = 0.

(05 Marks)

c. Derive one dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$

(05 Marks)

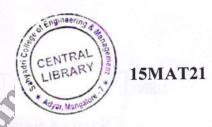
Obtain partial differential equation of $f(x^2 + 2yz, y^2 + 2zx) = 0.$

(06 Marks)

Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$, given that when x = 0, z = 0 and $\frac{\partial z}{\partial x} = a \sin y$.

(05 Marks)

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c. Find the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = C$ (05 Marks)

Module-4

- a. Evaluate $\int_{0}^{1} \int_{0}^{1-x} \int_{0}^{1-x-y} \frac{dx \, dy \, dx}{(1+x+y+z)^3}$. (06 Marks)
 - b. Evaluate integral $\int_{0}^{1} \int_{0}^{4x} xy \, dy \, dx$ by changing the order of integration. (05 Marks)
 - Obtain the relation between Beta and Gamma function in the form $\beta(m,n) = \frac{\overline{m \mid n}}{\overline{m+n}}$ (05 Marks)

- Evaluate $\iint e^{-(x^2+y^2)} dxdy$ by changing into polar co-ordinates. (06 Marks) 8
 - b. If A is the area of rectangular region bounded by the lines x = 0, x = 1, y = 0, y = 2 then evaluate $\int (x^2 + y^2) dA$. (05 Marks)
 - c. Evaluate $\int_{0}^{\pi/2} \frac{d\theta}{\sqrt{\sin \theta}} \int_{0}^{\pi/2} \sqrt{\sin \theta} d\theta$ using Beta and Gamma functions. (05 Marks)

- a. Find Laplace transition of i) t^2e^{2t} ii) $e^{-at} e^{-bt}$. (06 Marks)
 - If a periodic function of period 2a is defined by $f(t) = \begin{cases} t & \text{if } 0 \le t \le a \\ 2a t & \text{if } a \le t \le 2a \end{cases}$

Then show that
$$L\{f(t)\}=\frac{1}{s^2}\tan h\left(\frac{as}{2}\right)$$
. (05 Marks)

Solve $y''(t) + 4y'(t) + 4y(t) = e^t$ with y(0) = 0 y'(0) = 0. Using Laplace transform. (05 Marks)

- 10 a. Find $L^{-1} \left[\frac{7s}{(4s^2 + 4s + 9)} \right]$ (06 Marks)
 - b. Find $L^{-1}\left[\frac{s}{(s-1)(s^2+4)}\right]$ using convolution theorem. (05 Marks)
 - Express the following function interms of Heaviside unit step function and hence its Laplace transistor $f(t) = \begin{cases} t^2, & 0 < t \le 2\\ 4t, & t > 2 \end{cases}$ (05 Marks)