

17MAT21

of

Second Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics -

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- I a. Solve $(D^2 + 1)y = 3x^2 + 6x + 12$. (06 Marks)
 b. Solve $(D^3 + 2D^2 + D)y = e^x$. (07 Marks)
 c. By the method of undetermined coefficients, solve $(D^2 + D - 2)y = x + \sin x$. (07 Marks)

OR

- 2 a. Solve $(D^2 - 6D + 9)y = 6e^{3x} + 7e^{2x}$. (06 Marks)
 b. Solve $(D^3 - D)y = (2x + 1) + 4\cos x$. (07 Marks)
 c. By the method of variation of parameters, solve $(D^2 + 1)y = \operatorname{cosec} x$. (07 Marks)

Module-2

- 3 a. Solve $x^2 y'' - 3xy' + 4y = 1 + x^2$. (06 Marks)
 b. Solve $xyp^2 - (x^2 + y^2)p + xy = 0$. (07 Marks)
 c. Solve $(px - y)(py + x) = a^2 p$ by taking $x^2 = x$ and $y^2 = y$. (07 Marks)

OR

- 4 a. Solve $(2 + X)^2 y'' + (2 + x)y' + y = \sin(2\log(2 + x))$. (06 Marks)
 b. Solve $yp^2 + (x - y)p - x = 0$. (07 Marks)
 c. Obtain the general and singular solution of the equation $\sin px \cos y = \cos px \sin y + p$. (07 Marks)

Module-3

- 5 a. Form a partial differential equation by eliminating arbitrary function $lx + my + nz = 4(x^2 + y^2 + z^2)$. (06 Marks)
 b. Solve $\frac{a^2 z}{ax^2} = x_y$ subject to the conditions $\frac{az}{ax} = \log(1 + y)$ when $x = 1$ and $z = 0$ when $x = 0$. (07 Marks)
 c. Derive an expression for the one dimensional wave equation. (07 Marks)

OR

- 6 a. Form a partial differential equation $z = f(y + 2x) + g(y - 3x)$. (06 Marks)
 b. Solve $\frac{a^2 z}{ay} = z$, given that when $y = 0$, $z = ex$ and $\frac{az}{ay} = -1$. (07 Marks)
 c. Find all possible solutions of heat equation $u_t = c^2 u$, by the method of separation of variables. (07 Marks)

17MAT2

Module-4

- 7 a. Evaluate $\int_0^{\pi} \int_0^{a(1-\cos\theta)} r \sin\theta \, dr \, d\theta$ over the cardioids $r = a(1 - \cos\theta)$ above the initial line. (06 Marks)
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- b. Evaluate $\int_0^1 \int_0^1 x \, dz \, dx \, dy$ (07 Marks)
- c. Derive the relation between Beta and Gamma function as $B(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (07 Marks)

OR

- 8 a. Evaluate by changing the order of integration if $\int_0^2 \int_y^2 dy \, dx$. (06 Marks)
- b. Find by double integration, the area lying between the parabola $y = 4x - x^2$ and the line $y = x$. (07 Marks)
- c. Show that $\int_0^2 \sqrt{4-x^2} \, dx = \frac{\pi}{2}$ (07 Marks)

Module-5

- 9 a. Find the Laplace transform of $t \cos 2t$. (06 Marks)
- b. Find the Laplace transform of $f(t) = E \sin \cot$, $0 < t < \pi$ having the period π . (07 Marks)
- c. Solve $y'' - 3y' + 2y = 2e^t$, $y(0) = y'(0) = 0$ by using Laplace transforms. (07 Marks)

OR

- 10 a. Find the inverse Laplace transforms of $\frac{s+1}{2s+2} + \log \frac{s+a}{s+b}$. (06 Marks)
- b. By using convolution theorem, find $1 \cdot 1$. (07 Marks)

- c. Express $f(t) = \begin{cases} \sin t, & 0 < t < \pi \\ \cos t, & \pi < t < 2\pi \end{cases}$ in terms of unit step functions and hence find its Laplace transform. (07 Marks)

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