Model Question Paper with effect from 2017-18

USN | | | | | | | | | | | **17MAT21**

Second Semester B.E.(CBCS) Examination
Engineering Mathematics-II
(Common to all Branches)

Time: 3 Hrs   Max.Marks: 100

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

Module-I

1. (a) Solve: $\left(D^3 + 6D^2 + 11D + 6\right)y = 0$, where $D = d/dx$. **(06 Marks)**

   (b) Solve: $(D-2)^2 y = 8\left(e^{2x} + \sin 2x\right)$, where $D = d/dx$. **(07 Marks)**

   (c) Solve: $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = x + \sin x$, using the method of undetermined coefficients. **(07 Marks)**

OR

2. (a) Solve: $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$ **(06 Marks)**

   (b) Solve: $\left(D^2 + 2D + 1\right)y = 2x + x^2$, where $D = d/dx$. **(07 Marks)**

   (c) Solve: $\left(D^2 + 1\right)y = \tan x$ by the method of variation of parameters, where $D = d/dx$. **(07 Marks)**

Module-II

3. (a) Solve: $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = (1+x)^2$. **(06 Marks)**

   (b) Solve: $p(p+y) = x(x+y)$. **(07 Marks)**

   (c) Find the general and singular solution of the equation $xp^2 - py + a = 0$. **(07 Marks)**

OR

4. (a) Solve: $(1+x)^2 \frac{d^2y}{dx^2} - (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$ **(06 Marks)**

   (b) Solve: $p^2 + 2py\cot x = y^2$. **(07 Marks)**

   (c) Solve $(px-y)(py+x) = 2p$ by reducing it to Clairaut's form, by taking the substation $X = x^2, Y = y^2$ **(07 Marks)**

Module-III

5. (a) Form the PDE by eliminating the arbitrary function f from $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$ **(06 Marks)**

(b) Solve $\left[\partial^2 z/\partial x \partial y\right] = \sin x \sin y$ subject to the conditions $\left[\partial z/\partial y\right] = -2\sin y$ when $x = 0$ & $z = 0$ if y is odd multiple of $\pi/2$. **(07 Marks)**

(c) Derive one dimensional heat equation in the form $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ **(07 Marks)**

OR

6. (a) Form the PDE by eliminating the arbitrary functions f & g from $z = f(x + ay) + g(x - ay)$ **(06 Marks)**

(b) Solve $\left[\partial^2 z/\partial y^2\right] = z$ subject to the conditions $\left[\partial z/\partial y\right] = e^{-x}$ & $z = e^x$, when $y = 0$ **(07 Marks)**

(c) Find the solution of one dimensional wave equation, using the method of separation of variables. **(07 Marks)**

Module-IV

7. (a) Evaluate the double integral $\int_0^a \int_y^a \frac{x}{x^2 + y^2}\, dx\, dy$ by changing the order of integration. **(06 Marks)**

(b) Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} \left(x^2 + y^2 + z^2\right) dx\, dy\, dz$ **(07 Marks)**

(c) Derive the relation between Beta and Gamma functions as $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ **(07 Marks)**

OR

8. (a) Evaluate $\int_0^\infty \int_0^\infty e^{-\left(x^2 + y^2\right)}\, dx\, dy$ by changing the variables to polar form. **(06 Marks)**

(b) Using the double integration, find the area of a loop of the lemniscate $r^2 = a^2 \cos 2\theta$ lying between $\theta = 0$ & $\theta = \pi/4$ **(07 Marks)**

(c) Prove that $\int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta \int_0^{\pi/2} \frac{1}{\sqrt{\sin\theta}}\, d\theta = \pi$ **(07 Marks)**

Module-V

9. (a) Find the Laplace transform of $\frac{\cos at - \cos bt}{t} + \sin at$ **(06 Marks)**

(b) A Periodic function $f(t)$ with period "a" is defined by $f(t) = \begin{cases} E, & 0 \le t < a/2 \\ -E, & a/2 \le t < a \end{cases}$

Show that $L\{f(t)\} = (E/s)\tanh(as/4)$. **(07 Marks)**

(c) Find the inverse Laplace transform of $\log\left(\frac{s(s+5)}{(s^2+25)(s-7)}\right)$ **(07 Marks)**

OR

10. (a) Express $f(t) = \begin{cases} \cos t & 0 < t < \pi \\ \cos 2t & \pi < t < 2\pi \\ \cos 3t & t > 2\pi \end{cases}$ in terms of unit step function and hence

find its Laplace transform. **(06 Marks)**

(b) Solve the differential equation $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{-x}$ with $y(0) = y'(0) = 1$,

using Laplace transform method. **(07 Marks)**

(c) Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$, using convolution theorem. **(07 Marks)**

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