USN 2KL13ME026

10MAT21

Second Semester B.E. Degree Examination, June / July 2014

Engineering Mathematics - II

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer FIVE full questions choosing at least two from each part.*
2. *Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.*
3. *Answers to objective type questions on sheets other than OMR will not be valued.*

PART - A

1 a. Choose the correct answer : **(04 Marks)**

i) The general Solution of the equation $x^2p^2 + 3xyp + 2y^2 = 0$ is

(A) $(y^2x - C)(Xy - c) - 0$ (B) $(x-y-o)(x_2^2 + 7_2 - c) = 0$
(C) $(xy - c)(x\ y-c) = 0$ (D) $(y-x-b)(x + y + c) = 0$

ii) The given differential equation is solvable for y, if it is possible to express y in terms of

(A) y and p (B) x and p (C) x and y (D) y and x

iii) The singular solution of Clairaut's equation is ______

(A) $y = xg(x) + f[g(x)]$ (B) $y = cx + f(c)$
(C) $cy + f(c)$ (D) $y\ g(x) + f[g(x)]$

iv) The singular solution of the equation $y = px - \log p$ is _____

(A) $y^2 = 4ax$ (B) $x = 1, \log x$ (C) $y = 1 - \log\left(\frac{1}{x}\right)$ (D) $x^2 - y \log x$

b. Solve $p^2 - 2p \sinh x - 1 = 0$. **(04 Marks)**

c. Solve $y = 2px + \tan^{-1}(xp^2)$. **(06 Marks)**

d. Obtain the general solution and singular solution of Clairaut's equation is $(y - px)(p-1) = p$. **(06 Marks)**

2 a. Choose the correct answer **(04 Marks)**

i) The complementary function of $[D^4 + 4]\ x = 0$ is

(A) $x = e^t[c_1 \cos t + c_2 \sin t] + [c_3 \cos t + c_4 \sin t]$
$[c_1 \cos t + C_2 \sin t] + [C_3 \cos t + C_4 \sin t]$
$x = [c_1 + c_2 t]\ e^4$
(D) $x = [c_1 + c_2 t]$

ii) Find the particular integral of $(D^3 - 3D^2 + 4)\ y = e^{2x}$ is ____

(A) $x\frac{e^{2x}}{6}$ (B) $\frac{x^2e^{3x}}{6}$ (C) $\frac{x^2e^{x}}{6}$ (D) $\frac{x^2e^{4x}}{6}$

iii) Roots of $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0$ are _____

(A) $2 \pm i$ (B) $3 + i$ (C) $2 \pm 2i$ (D) $-2 +$

iv) Find the particular integral of $(D^3 + 4D)\ y = \sin 2x$ is ______

(A) $\frac{x \sin x}{8}$ (B) $-\frac{x \sin x}{8}$ (C) $-\frac{x \sin 2x}{8}$ (D) $\frac{x \sin 2x}{8}$

b. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = e^x + 1$. **(04 Marks)**

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

d. Solve $\frac{dy}{dx}+y=ze^{x}\frac{dz}{dx}$ (06 Marks)

3 a. Choose the correct answer : (04 Marks)

i) The Wronskian of x and x e^x is ____
(A) ex (B) e2x (C) e^{-2x} (D) ex.

ii) The complementary function of $x^2y'' - xy' - 3y = x^2 \log x$ is ____
(A) ci cos (log x) + c2 sin (log x) (B) $c_1 x^{-1} + c_2x^3$
(C) c ix + $c2x^3$ (D) cicos x + c2 sin x.

iii) To transform $(1+x)^2y'' + (1+x)y' + y = 2 \sin \log (1 + x)$ into a line& differential equation with constant coefficient ____
(A) $(1+x) = e^t$ (B) $(1+x) = e^{-t}$ (C) $(1+x)^2 - e^t$ (D) $(1-x)^2 = e^t$.

iv) The equation $a_0(ax+b)^2y'' + a_0(ax+b)y' + a_2y = 4(x)$ is ____
(A) Simultaneous equation (B) Cauchy's linearvpation
(C) Legendre linear equation (D) Euler's equag174#:'

b. Using the variation of parameters method to solve the equatio 4,7 1- 2y' + y = ex log x. (04 Marks)

c. Solve $x^2\frac{d^2y}{dx^2}-(2m-1)x\frac{dy}{dx}+(m^2+n^2)y = n^2 x \sin \log x$, (06 Marks)

d. Obtain the Frobenius method solve the equation

$x\frac{d^2y}{dx^2}+\frac{dy}{dx}-y=0$ (06 Marks)

4 a. Choose the correct answer : (04 Marks)

i) Partial differential equation by elitninating a and b from the relation $Z = (x-a)^2 + (y-b)^2$ is
(A) $p^2 + q^2 = 4z$ (B) .04== (C) r – 4z (D) t = 4

ii) The Lagranges's linear partial differential Pp + Qq = R the subsidiary equation is ____
(A) $\frac{dx}{R}=\frac{dy}{P}=\frac{dz}{Q}$ (B) $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ (C) $\frac{dx}{Q}=\frac{dy}{R}=\frac{dz}{P}$ (D) $\frac{dx}{P}+\frac{dy}{Q}=\frac{dz}{R}$

iii) By the method of separation of variable we seek a solution in the form is ____
(A) x = x + (B) $z = x^2 + y^2$ (C) x z + (D) x – x(x) y(y)

iv) The solution of $\frac{\partial^2 z}{\partial x^2} = \sin (xy)$ is ____
(A) $z = -x^2 \sin (xy) + y f(x) + \phi(x)$ (B) $\frac{-\sin(xy)}{y^2} + x f(y) + \phi(y)$
(C) z $\frac{xy}{x}$ y f(x) + (1)(x) (D) None of these.

b. Form the partial differential equation of all sphere of radius 3 units having their centre in the xy - plane. (04 Marks)

c. Solve $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$. (06 Marks)

d. Use the method of separation of variables to solve

$y^3\frac{\partial z}{\partial x} + x^2\frac{\partial z}{\partial y} = 0$ (06 Marks)

PART - B

5 a. Choose the correct answer : (04 Marks)

i) The value of $\int_0^1\int_0^{x^2} e^{y/x}\,dy\,dx$ is ____
(A) 0 (B) 1 (C) 3 (D) 'A .

ii) The value off ( )is___ -?"4.9., 0/'Eracr

(A) 2 „ri (B) n (C) (D) 427c .

iii) The integral dxdy after changing the order of integration is _____

(A) j fa x +y (B) f -,1,dxdy 0 0 x +y

(C) f +y (D) ∫∫ 0 0 x +y

4v) The value of 13(3,) is ___

) 15/16 (B) 16/15 (C) 16/5 (D)

b. Change- order of integration in 4a ... dydx and hence evaluate the same. **(04 Marks)**

c. Evaluate j j f y² + z²)dx dy dz. **(06 Marks)**

d. Prove that x / 1/1 – x x k 1 1+x4 x - 4,5 **(06 Marks)**

6 a. Choose the correct answer **(04 Marks)**

i) Let S be the closed boundary surface of a region of volume V then for a vector field f defined in V and in S $E_nd_s is ___________

(A) curl f dv (B) div f dv (C) I grad f dv (D) None of these

ii) If SE& where f = 3xy1 - j and C is the part of the parabola y # 2x ² from the region (0, 0) to the point 2) is

(A) 7/ (B) –% (C) 3x -E 3y (D) -35

iii) In the Green'slheorem in the plane fMdx + Ndy = ___________

(A). fir +]dxdy (B) ff(am aN)dxdy

(C) iliV N)dxdy (D) 111 N + am dxdy

iv) A necessary and sufficient condition that the line integral p.. dr for any closed curve C is ___________

(A) divF = 0 (B) divF # 0 (C) curlF = 0 (D) grad F = 0

b. Using the divergence theorem, evaluate if .nds where f = 4xzi - y ²3 + yzk and S is the surface of the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1. **(04 Marks)**

c. Use the Green's theorem, evaluate if (2x² – y²)dx +(x² + y²)dy where C is the triangle formed by the lines x = 0, y = 0 and x + y = 1. **(06 Marks)**

d. Verify the Stoke's theorem for f = -y ³1+ xl where S is the circle disc x ² + y² < 1, z = 0. **(06 Marks)**