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10MAT21

Second Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Mathematics -

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 -

PART — A

1 a. Choose the correct answers for the following : (04 Marks)

i) A differential equation of the first order but of higher degree, solvable for x, has the solution as:
A) F(y, p, c) = 0 B) F(x, p, c) C) F(x, y, c) = 0 D) CI, C2) = 0

ii) If $xy + C = C^2x$ is the general solution of a differential equation then its singular solution is
A) y = x B) y=-x C) $4x^2y+1=0$ D) $4x^2y-1=0$

iii) The general solution of Clairant's equation is,
A) y = Cf (x) + f(C) B) y = Cx + f(C) C) x = Cf(y) + f(C) D) x = Cy +g(C)

iv) The general solution of $p^2 - 7p + 12 = 0$ is,
A) (y —3x — c)(y —4x —c) = 0 B) (y — c)(x —c) = 0
C) (3x c)(4x — c) D) (y +3x + c)(y —4x — c) = 0

b. Solve : $xp^2 - (2x+3y)p + 6y = 0$. (05 Marks)

c. Solve : y =3x +logp (05 Marks)

d. Obtain the general solution and the singular solution of the equation $xp^3\ yp^2 + 1 = 0$ as Clairant's equation. (06 Marks)

2 a. Choose the correct answers for the following : (04 Marks)

i) The particular integral of $(D^2 + a^2)y = \sin ax$ is,
A) $\frac{-x\cos ax}{2a}$ B) $\frac{x\cos ax}{2a}$ C) $\frac{x\sin ax}{2a}$ D) $\frac{-x\sin ax}{2a}$

ii) The solution of the differential equation $(D^4 - 5D^2 + 4)y = 0$ is,
A) $y = C_1e^{x} + C_2e^{-} + C_3e^{2}x + C_4e^{-2}1$
B) $y = (C_1 + C_2x + C_3x^2 + C_4x^{3})e^{2x}$
C) $y = C_1 \cos x + C_2 \sin x + C_3 \cos 2x + C_4 \sin 2x$
D) None of these

iii) The particular integral of $(D - 1)^2y$ --.3ex is,
A) $-\frac{3}{2}xex$ B) $-\frac{3}{2}x^2e^x$ C) $\frac{3}{2}x^2ex$ D) $\frac{2}{3}x^{-}ex$

iv) The roots of auxiliary equation of $D^{2}(D^2 + 2D)^2y = 0$ are:
A) 0,0,0,0,2,2 B) 0,0,0,0,-2,-2 C) 0,0,2,2,-2,-2 D) 2,2,2,2,0,0

b. Solve : $(D^2 - 2D + 1)y = xe^x + x$ (05 Marks)

c. Solve : $(D^2 - 4D + 4)y = e^2x + \cos 2x + 4$. (05 Marks)

d. Solve : $\frac{dx}{dt} - 7x + y = 0,\ \frac{dy}{dt} - 2x - 5y = 0$. (06 Marks)

3 a. Choose the correct answers for the following : (04 Marks)

i) The complementary function of $x^2y'' - 3xy' + 4y = x$ is:

A) $(C_1 + C_2 \log x)x^2$ B) $(C_1 + C_2x)e^2 1$

C) $C_1 + C_2 x$ D) $\frac{C_1}{x} + \frac{C_4}{x}$

ii) By the method of variation parameters, the value of 'W' is called,

A) Euler's function B) Wronskian of the function

C) Demorgan's function D) Cauchy's function

iii) The equation $(2x+1)^2 y'' - 6(2x+1)y' + 16y = 8(2x+1)^2$ by putting g 2x +1)

with D = $\frac{}{dz}$ reduces to

A) $(D^2 + 4D + 4)y = 3e^2 z$ B) $(D^2 - 4D + 4)y = 2e^2 z$

C) $(D^2 - 4D + 4)y = 0$ D) None of.these

iv) To find the series solution for the equation $2x^2y'' - xy' + (1 - x^2)y = 0$, we assume the solution as,

A) y= Ea$_r$x S) y=Ea$_{r+1}$xr^{+1} x^{r+1} =Ea$_r$x^{k+}

b. Solve : $(D^2 + a^2)y = \sec ax$ by method of variation of parameters. (05 Marks)

c. Solve $(3x+2)^2 y'' + 3(3x+2)y' - 36y = 8x^2 + 4x + 1$ (05 Marks)

d. Solve : $y'' + xy' + y = 0$ in series solution. (06 Marks)

a. Choose the correct answers for the following : (04 Marks)

i) $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$, d'3140e arbitrary constants is a solution of:

A) $2z = p^2x + qy$.- B) $2z = px + q^2y$ C) $2z = px + qy$ D) None of these

ii) Trrauxiliary equations of Lagrange's linear equation $Pp + Qq = R$ are:

A) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ B) $\frac{dx}{p} = \frac{dy}{q} = \frac{dz}{R}$, $\frac{dx}{x}\ \frac{dy}{y}\ \frac{dz}{z}$ D) $\frac{dx}{x} + \frac{dy}{y} + \frac{dz}{z} = 0$

iii) General solution of the equation $\frac{\partial^2 z}{\partial x^2} = x + y$ is,

A) $\frac{x^3}{6} + \frac{x}{2} + f(y) + g(y)$ B) $\frac{x^3}{6}\ \frac{x^2y}{2} + f(y) + yg(y)$

C) $\frac{x^3}{6} + \frac{x^2y}{2} + xf(y) + g(y)$ D) $\frac{x^3}{6} + \frac{x^2y}{2} + xf(y) + yg(y)$

iv) Suitable set of multipliers to solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$ is,

A) (0, 1, 1) B) (x, y, z) C) $\left(0, \frac{1}{x}, \frac{1}{y}\right)$ D) $\left(\frac{1}{x}, \frac{1}{y}, \frac{1}{z}\right)$

b. Form a partial differential equation by eliminating arbitrary function from the relation, $(1)(xy + z^2, x + y + z) = 0$ (05 Marks)

c. Solve : $(y^2 + z^2)p + x(yq - z) = 0$ (05 Marks)

d. Solve by the method of separation of variables $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ (06 Marks)

PART— B

a. Choose the correct answers for the following : (04 Marks)

i) 2x ff(X y)dydx =
as

A) 3 B) 4 C) 5 D) 6

ii) 2 3 2 if f Xy ^{2} zdzdydx =
oi

A) 36 B) 16 C) 26 D) 46

iii) The integral 21 ^{2} dx is,

A) $\Gamma(\frac{1}{2})$ B) $\Gamma(-\frac{1}{2})$ C) $\Gamma(\frac{1}{2})$ D) $\Gamma(-\frac{3}{2})$

iv) The value of $\beta(5, 3) + \beta(3, 5)$ is:

A) $\frac{2}{35}$ B) $\frac{3}{4}$ C) $\frac{3}{35}$ D) $\frac{4}{35}$

b. Evaluate ff xy(x + y)dydx taken over the area between y = x^2 and y = x. (05 Marks)

c. Evaluate : $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x + y + z)\,dy\,dx\,dz$ (05 Marks)

d. Show that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \times \int_0^{\pi/2}\frac{d\theta}{\sqrt{\sin\theta}} = \pi$ (06 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

i) Gauss Divergence theorem is a relation between:
A) a line integral and a surface integral B) a surface integral and a volume integral
C) a line integral and a volume integral D) two volume integrals

ii) $\oint_c Mdx + Ndy$ is also equal to,

A) $\iint_R\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)dxdy$ B) $\iint_R\left(\frac{\partial M}{\partial y} + \frac{\partial N}{\partial x}\right)dxdy$

C) $\iint_R\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)dxdy$ D) $\iint_R\left(\frac{\partial N}{\partial x} + \frac{\partial M}{\partial y}\right)dxdy$

iii) Using the following integral, work done by a force F can be calculated:
A) Surface integral B) Volume integral C) Both (A) and (B) D) Line integral

iv) If F = x^2i + xyj then the value of $\int$F. dr from (0, 0) to (1, 1) along the line y — x is,

A) 2 / 3 B) 3 / 2 C) 1 / 3 D) 1/2

b. Find the area between the parabolae, $y^2 = 4x$ and $x^2 = 4y$ with the help of Green's theorem in a plane. (05 Marks)

c. Evaluate $\oint$ xydx + xy^{2}dy by Stoke's theorem where C is the square in the x-y plane with vertices (1, 0), (-1, 0), (0, 1) and (0, -1) (05 Marks)

d. Evaluate $\iint$F.nds given F = xi + yj + zk over the sphere $x^2 + y^2 + z^2 = a^2$ by using Gauss divergence theorem. (06 Marks)

a. Choose the correct answers for the following : (04 Marks)

i) If L{f(t)} = F(s) then L{ M is,

A) IF(ods B) 1F(s)ds C) IF(s)ds D) 1F(s)ds

ii) If L tcos at - cos bt} t = 1/2 leg (s^2 + b^2)/(s^2 + a^2) then L{ sin 2t / t 1.

A) 1/4 log(s^2+4 / s^2) B) 1/2 log s2 + 1 / s^2 C) 1/4 log(s / s2 + 4 D) 1/2 s / s^2 + 4

iii) L{e^3t H(t -4)}=

A) e^12-4s / s + 3 B) e^12-4s / s - 3 C) e^12+4s / s + 3 e^-4s / s - 3

iv) 4'6(t- a)}=

A) (-a) e B) aneas C) ane^-as D) e'

b. Find the Laplace transform of $t^5 e^{4t}$ cosh3t. (05 Marks)

c. Find +^-li ft sin 3t (05 Marks)

d. Given f(t) = E, 0 < t < a/2 ; − E, a/2 < t < a where g(t+a) - g0, show that L{f(t)} = E/s tanh as/4). (06 Marks)

8 a. Choose the correct answer for the following : (04 Marks)

i) } =

tl e (1/2 6 B) et 1/2 + 1/6 t2 1+ t / 0 6) Dh2e- (1/2 4/6

ii) 1:4 s + / (s - 4 t

A) B) 1-e4t / t C) e4t- e-3t / t e-4t - e-3t / t

iii) L^{-1} { s / s^2+5

A) sin 5t B) 1/7 cos j t C) 1/5 cos5t D) cos ,5 t

iv) L^{-1} 1 / (s^2 + a^2)^2 } =

A) t sin at B) t cos at / 2a C) t sin at / 2a D) tcosat

b. Find L^{-1} { s2 +4 / s(s + 4)(s − 4) . (05 Marks)

c. Find L' 1 / (s − 1)(s^2 + 0) by using convolution theorem. (05 Marks)

d. Solve by using Laplace transform y"(t)+ y(t) = 0 ; y(0) = 2, y(π/ 2)=1 (06 Marks)

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