Hall Ticket Number:

CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, SEPTEMBER-2024

Semester II [First Year] (Supplementary)

MATHEMATICS - II

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:

(a) Find the solution of $\frac{dy}{dx} + y = 0$, given that y(0) = 5. CO1

(b) Find the integrating factor of $xy' + y = x^3y^6$. CO1

(c) Find the differential equation whose auxiliary equation has the roots 0, -1, -1. CO1

(d) Write the general form of Legendre's linear equation. CO2

(e) Find the value of the integral $\int_0^3 \int_0^2 (4-y)^2 \, dydx$. CO2

(f) Evaluate $\int_{-1}^1 \int_0^z \int_1^y dxdydz$. CO2

(g) State Green's theorem. CO3

(h) Define circulation. CO3

(i) State Stokes' theorem CO3

(j) Give an example for regular function. CO4

(k) For what values of k the function $2x - x^2 + ky^2$ is harmonic. CO4

(l) Write Cauchy's integral theorem. CO4

(m) Find $\int_C \frac{1}{z-a} dz$ where C: $|z - a| = r$. CO4

(n) Define entire function. CO4

UNIT – I

2. (a) Solve: $y \log y \, dx + (x - \log y) \, dy = 0$. (7M) CO1

(b) Solve: $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$. (7M) CO1

(OR)

3. (a) Solve: $y'' - 2y' + 2y = x + e^x \cos x$. (7M) CO1

(b) Solve: $x^2 \frac{d^2y}{dx^2} + 5x \frac{dy}{dx} + 4y = x \log x$. (7M) CO1

UNIT – II

4. (a) Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\,dy\,dx$ by changing the order of integration. (7M) CO2

(b) Evaluate $\iint r \sin\theta \, dr \, d\theta$ over the cardioid $r = a(1 - \cos\theta)$ above the initial line. (7M) CO2

(OR)

5. (a) Find, by double integration, the area lying between the parabola $y = x^2$ and the line $x + y - 2 = 0$. (7M) CO2

(b) Find the volume bounded by the paraboloid $x^2 + y^2 = az$, the cylinder $x^2 + y^2 = 2ay$ and the plane $z = 0$. (7M) CO2

UNIT – III

6. (a) Apply Green's theorem to evaluate $\int_c [(xy + y^2)dx + x^2\,dy]$ where c is bounded by $y = x$ and $y = x^2$. (7M) CO3

(b) Evaluate $\int_S F.N dS$, where $F = 18zi - 12j + 3yk$ and S is the portion of the plane $2x + 3y + 6z = 12$ in the first octant. (7M) CO3

(OR)

7. (a) Show that $f(x) = \begin{cases} \frac{z^5}{|z|^4}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ satisfies C-R equations at $z = 0$ but not differentiable at $z = 0$. (7M) CO3

(b) Show that an analytic function of constant absolute value is constant. (7M) CO3

UNIT – IV

8. (a) Find the analytic function $f(z) = u + iv$ when $v = r^2 \cos 2\theta - r \cos\theta + 2$. (7M) CO4

   (b) Show that $u = 4xy - 3x + 2$ is harmonic. Also construct the corresponding analytic function $f(z) = u + iv$ interms of z. (7M) CO4

(OR)

9. (a) Evaluate $\int_0^{2+i} z^2 \, dz$ along the imaginary axis 0 to i and then horizontally to 2 + i. (7M) CO4

   (b) Evaluate $\int_C \frac{z^2 - z - 1}{z(z-1)} dz$, where $C: \left|z - \frac{1}{2}\right| = 1$ using Cauchy's integral formula. (7M) CO4

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CE/EC/ME121 (R20)

Hall Ticket Number:

CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, JULY-2024

Semester II [First Year] (Regular)

MATHEMATICS-II

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Write Bernoulli's differential equation. CO1
   - (b) Solve $(D^2 + 1)y = 0$. CO1
   - (c) Write Legendar's linear equation. CO1
   - (d) Change the order of integration $\int_{-a}^{a}\int_{0}^{\sqrt{a^2-y^2}} f(x, y)\, dxdy$ CO2
   - (e) Evaluate $\int_{-1}^{1}\int_{-2}^{2}\int_{-3}^{3} dx\, dy\, dz$ CO2
   - (f) Evaluate $\int_0^1\int_0^x e^x\, dxdy$ CO2
   - (g) State Green's theorem. CO3
   - (h) State Gauss Divergence theorem. CO3
   - (i) Write C-R equations in polar forms. CO3
   - (j) Give an example of not an analytic function. CO3
   - (k) Define harmonic function. CO4
   - (l) Write Cauchy's integral formula. CO4
   - (m) Evaluate $\int_C \frac{dz}{z+2}$ where C is the circle $|z| = 1$. CO4
   - (n) State Cauchy's theorem. CO4

UNIT – I

2. (a) Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$ (7M) CO1
   (b) Solve $(D^2 - 2D + 4)y = e^x \cos x$. (7M) CO1

(OR)

3. (a) Solve $(1 + y^2)\, dx = (\tan^{-1} y - x)dy$. (7M) CO1

(b) Using the method of variation of parameters, Solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$ (7M) CO1

UNIT – II

4. (a) Change the order of integration and hence evaluate the double integral $\int_1^2 \int_{x^2}^{2-x} xy\, dxdy$ (7M) CO2

(b) Evaluate the integral $\iiint xy^2z\, dx\, dy\, dz$ taken through the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$. (7M) CO2

(OR)

5. (a) Evaluate $\iint (x^2 + y^2) dx\, dy$ over the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (7M) CO2

(b) Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $16a^2/3$ (7M) CO2

UNIT – III

6. Verify Gauss divergence theorem for the vector function $F = y\bar{i} + x\bar{j} + z^2\bar{k}$, over the cylindrical region bounded by $x^2 + y^2 = 9$, $z = 0$ and $z = 2$. CO3

(OR)

7. (a) Applying Green's theorem evaluate $\oint_c ((y - \sin x)dx + \cos x\, dy)$, where C is the plane triangle enclosed by the lines $y = 0$, $x = \frac{\pi}{2}$ and $y = \frac{2}{\pi}x$. (7M) CO3

(b) Construct the analytic function whose real part is $u = e^{-x}[(x^2 - y^2)\cos y + 2xy\sin y]$. (7M) CO3

UNIT – IV

8. (a) Evaluate $\int_c \frac{z^3 + z^2 + 2z - 1}{(z-1)^3}\, dz$ where c is the circle $|z| = 3$ using Cauchy's integral formula. (7M) CO4

   (b) Show that the function $u = 2\log(x^2 + y^2)$ is harmonic and find its harmonic conjugate. (7M) CO4

(OR)

9. (a) Using Milne-Thomson's method, find the analytic function f(z) when its real part is $u = e^x[(x^2 - y^2)cosy - 2xysiny]$. (7M) CO4

   (b) Apply Cauchy's theorem to evaluate $\int_c \frac{z^2 - z + 1}{z-1}\, dz$, where C is the circle $|z| = \frac{1}{2}$. (7M) CO4

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CE/EC/ME121(R20)

Hall Ticket Number:

CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, MAY-2024

Semester II [First Year] (Supplementary)

MATHEMATICS-II

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Define the linear differential equation. CO1
   - (b) Write conditions for the exact differential equations. CO1
   - (c) Write Cauchy's homogeneous linear equation. CO1
   - (d) Evaluate $\int_0^1\int_0^1\int_0^1 dxdydz$ CO2
   - (e) Evaluate $\int_0^1\int_0^x e^x\,dxdy$ CO2
   - (f) Change the order of integration $\int_{x=a}^{x=b}\int_{y=f_1(x)}^{f_2(x)} f(x,y)dy\,dx$. CO2
   - (g) State Stoke's theorem. CO3
   - (h) State Gauss divergence theorem. CO3
   - (i) Write C-R equations. CO3
   - (j) Define analytic function. CO3
   - (k) State Milne-Thomson method. CO4
   - (l) Evaluate $\int_c \frac{z^3}{(z-2)^2}dz$ where C is the circle $|z| = 1$. CO4
   - (m) Define harmonic function. CO4
   - (n) State Cauchy's integral formula. CO4

UNIT – I

2. (a) Solve $x\frac{dy}{dx} + y = \log x$ (7M) CO1
   (b) Solve $(D^2 - 2D + 4)y = e^x \cos x$. (7M) CO1

(OR)

3. (a) Solve $(xy^2 - e^{1/x^3})\,dx - x^2y\,dy = 0$. (7M) CO1

(b) Using the method of variation of parameters, solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x$ (7M) CO1

UNIT – II

4. (a) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{(x+y+z)}\, dzdydx$ (7M) CO2

(b) Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy\,dxdy$ and hence evaluate the same. (7M) CO2

(OR)

5. (a) Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $16a^2/3$. (7M) CO2

(b) Find the Volume bounded by the Cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$. (7M) CO2

UNIT – III

6. Verify Stoke's theorem for $F = (x^2 + y^2)\bar{i} - 2xy\bar{j}$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = b$. CO3

(OR)

7. (a) Evaluate $\int_c (x^2 + xy)dx + (x^2 + y^2)dy$ where c is the square formed by the lines $y = \pm 1$ and $x = \pm 1$ (7M) CO3

(b) Construct the analytic function whose real part is $u = e^{-x}[(x^2 - y^2)\cos y + 2xy\sin y]$. (7M) CO3

UNIT – IV

8. (a) Using Milne-Thomson's method, find the analytic function f(z) when its real part is $u = e^x\left[\left(x^2 - y^2\right)\cos y - 2xy\sin y\right]$. (7M) CO4

(b) Determine $\oint_C \frac{z^2 - z + 1}{z - 1}\, dz$, Where C is the circle $|z| = 1$. (7M) CO4

(OR)

9. (a) Find the analytic function whose imaginary part is $v = \frac{2\sin x \sin y}{\cos 2x + \cosh 2y}$. (7M) CO4

(b) Evaluate $\oint_C \frac{z^3 + z^2 + 2z - 1}{(z-1)^3}\, dz$, where c is $|z| = 3$ using Cauchy's integral formula. (7M) CO4

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CE/EC/ME121 (R20)

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Hall Ticket Number:

CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, NOVEMBER-2023

Semester II [First Year] (Supplementary)

MATHEMATICS - II

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Write Bernoulli's equation. CO1
   - (b) Define exact differential equation. CO1
   - (c) Solve $(D^2 + 1)y = 0$. CO1
   - (d) Write Cauchy's homogeneous linear equation of second order. CO1
   - (e) Evaluate $\int_0^{\pi} \int_0^{a\sin\theta} r \, dr \, d\theta$. CO2
   - (f) Change of order of integration in $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} \, dy \, dx$. CO2
   - (g) Evaluate $\int_0^1 \int_1^2 \int_2^3 xyz \, dx \, dy \, dz$. CO2
   - (h) State Stoke's theorem. CO3
   - (i) State Gauss divergence theorem. CO3
   - (j) Write C-R equations in cartesian form. CO3
   - (k) Define conjugate harmonic function. CO4
   - (l) Write Laplace's equation in two dimensions. CO4
   - (m) Evaluate $\int_C \frac{dz}{z-a}$ where C: $|z - a| = R$. CO4
   - (n) State Cauchy's integral theorem. CO4

UNIT – I

2. (a) Solve $\frac{dy}{dx} + y\tan x = y^2 \sec x$. (7M) CO1

   (b) Solve $x^2y\,dx - (x^3 + y^3)dy = 0$. (7M) CO1

(OR)

3. (a) Solve $\frac{d^2y}{dx^2}+a^2y=\operatorname{cosec} ax$ using method of variation of parameters. (7M) CO1

   (b) Solve $(2x+1)^2 y''-6(2x+1)y'+16y=8(2x+1)^2$. (7M) CO1

UNIT – II

4. (a) Evaluate $\int_0^3\int_0^{\sqrt{4-y}}(x+y)\,dx\,dy$ by changing the order of integration. (7M) CO2

   (b) Evaluate $\int_0^a\int_y^a \frac{x}{x^2+y^2}\,dx\,dy$ by changing to polar coordinates. (7M) CO2

(OR)

5. (a) Using double integration, find the area of a plate in the form of a quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. (7M) CO2

   (b) Find, bytriple integration, the volume of the sphere $x^2+y^2+z^2=a^2$. (7M) CO2

UNIT – III

6. Verify Green's theorem for $\int_C (xy+y^2)\,dx+x^2\,dy$, where C is bounded by y = x and y = x^2. CO3

(OR)

7. (a) Show that the function f(z) defined by f(z) = $\sqrt{|xy|}$ is not analytic at the origin even though Cauchy-Riemann equations are satisfied at the point. (7M) CO3

   (b) Show that an analytic function with constant real part is constant. (7M) CO3

UNIT – IV

8. (a) If f(z) is a regular function of z, Show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. (7M) CO4

(b) Applying Milne-Thomson method, construct an analytic function f(z) = u + iv whose real part is u = e^x cos y. (7M) CO4

(OR)

9. (a) Verify Cauchy's theorem by integrating e^{iz} along the boundary of the triangle with the vertices at the points 1 + i, –1 + i and –1 – i. (7M) CO4

(b) Evaluate, using Cauchy's integral formula $\int_c \frac{z+1}{z^2+2z+4}\,dz$ where c: | z + 1 + i| = 2. (7M) CO4

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CE/EC/ME121 (R20)

Hall Ticket Number:

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CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, JULY-2023

Semester II [First Year] (Regular & Supplementary)

MATHEMATICS - II

Time: Three hours

Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Define exact differential equation. CO1
   (b) Solve the differential equation $(D^2 - 4D + 13)y = 0$. CO1
   (c) Evaluate $\frac{1}{(D^2-1)}(x^2 + x)$. CO1
   (d) Evaluate $\int_{x=1}^{3} \int_{y=0}^{1} xy^2\, dx\, dy$. CO2
   (e) Calculate $\int\int r^3\, dr\, d\theta$ over the area included between the circles $r = 2\sin\theta$ and $r = 4\sin\theta$. CO2
   (f) Find the limits after changing the order of integration for $\int_0^b \int_0^{a/b\sqrt{b^2-y^2}} f(x,y)\, dx\, dy$. CO2
   (g) If $\bar{r} = \bar{x}i + \bar{y}j + \bar{z}k$ then evaluate $\nabla^2(r^2)$. CO3
   (h) State Gauss divergence theorem. CO3
   (i) Define analytic function. CO3
   (j) Find the analytic function whose real part is xy. CO4
   (k) Find a unit vector normal to the surface $x^3 + y^3 + z^3 + 3xyz = 3$. CO4
   (l) Write Cauchy-Riemann equations in polar form. CO4
   (m) The directional derivative $\phi = xyz$ at the point $(1, 1, 1)$ in the direction of $\hat{\imath}$. CO3
   (n) State Cauchy integral theorem. CO4

UNIT – I

2. (a) Solve $x\cos x\frac{dy}{dx} + y(x\sin x + \cos x) = 1$. (7M) CO1
   (b) Solve $(D^2 - 1)y = x\sin x + x^2e^x$. (7M) CO1

(OR)

3. (a) Solve $\left(y+\frac{y^3}{3}+\frac{x^2}{2}\right)dx+\frac{1}{4}(x+xy^2)dy=0.$ (7M) CO1

(b) Solve $(x+1)^2\frac{d^2y}{dx^2}+(x+1)\frac{dy}{dx}+y=2\sin(\log(x+1))$. (7M) CO1

UNIT – II

4. (a) Evaluate $\iint_R xy\,dx\,dy$ where R is the region bounded by x-axis and x = 2a and the curve $x^2=4ay.$ (7M) CO2

(b) Evaluate $\iint r\sin\theta\,dr\,d\theta$ over the cardioids $r=a(1-\cos\theta)$ above the initial line. (7M) CO2

(OR)

5. (a) Change the order of integration in the integral and hence evaluate it $\int_0^1\int_{\sqrt{y}}^{2-y} xy\,dx\,dy.$ (7M) CO2

(b) Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar coordinates. (7M) CO2

UNIT – III

6. (a) Find the directional derivative of the function $f=x^2+y^2+2z^2$ at the point P (1, 2, 3) in the direction of the line PQ where Q is the point (5, 0, 4). (7M) CO3

(b) Define curl of a vector function and show that $A=(x^2+xy^2)i+(y^2+x^2y)j$ is irrotational. (7M) CO3

(OR)

7. (a) Find the analytic function f(z) = u (r, θ), + iv (r, θ), when $v(r,\theta)=r^2\cos2\theta-r\cos\theta+2$. (7M) CO3

(b) Show that the real part of an analytic function f(z) = u + iv is harmonic. (7M) CO3

UNIT – IV

8. (a) If f (z) = u + iv is an analytic function of z and if u − v = $e^x(\cos y - \sin y)$ find f(z) in terms of z. (7M) CO4

   (b) If $f(z)$ is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ (7M) CO4

(OR)

9. (a) Evaluate $\int_C (y-x-3x^2 i)dz$, where c consists of the line segments from z = 0 to z = i and the other from z = i to z = 1+ i. (7M) CO4

   (b) Integrate by Cauchy's integral formula $\frac{z^2}{z^2-1}$ counter clockwise around the circle $|z+1-i| = \frac{\pi}{2}$. (7M) CO4

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CE/EC/ME121 (R20)

Hall Ticket Number:

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CE/EC/ME121 (R20)

B.TECH. DEGREE EXAMINATION, JANUARY-2023

Semester II [First Year] (Supplementary)

MATHEMATICS-II

Time: Three hours — Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Find the integrating factor of $\frac{dy}{dx} + 2xy = e^{-x^2}$ CO1
   - (b) Find the complementary function of $\frac{d^2y}{dx^2} + 4y = 0$ CO1
   - (c) Solve $(D^2 + 16)\,y = 0$. CO1
   - (d) Evaluate $\int_0^2 \int_0^{x^2} y\,dx\,dy$ CO2
   - (e) Find the value of the integral $\int_0^{\pi} \int_0^{x} x \sin y\,dx\,dy$ CO2
   - (f) Transform $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2 + y^2)\,dx\,dy$ to polar coordinates. CO2
   - (g) Define irrotational vector. CO3
   - (h) State Green's theorem. CO3
   - (i) Show that the function $f(z) = xy + i\,y$is everywhere continuous but is not analytic. CO3
   - (j) State the necessary and sufficient conditions for a function $f(z)$ to be analytic. CO4
   - (k) Define Harmonic function. CO4
   - (l) Evaluate $\oint_C \frac{z^2+4}{z-3}\,dz$ where C is the circle $|z| = 5$. CO4
   - (m) If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is position vector, then the value of $\nabla(\log r)$. CO3
   - (n) Find the harmonic conjugate of $u = x^3 - 3xy^2$. CO4

UNIT – I

2. (a) Solve $(1+ y^2)dx = (\tan^{-1} y - x)dy$ (7M) CO1
   (b) Solve $(D^2 + 1)y = \sec x$. (7M) CO1

(OR)

3. (a) Solve $(1 + xy + x^2y^2)ydx + (x^2y^2 - xy + 1)xdy = 0$ (7M) CO1
   (b) Solve $(x^2D^2 - 3xD + 1)y = \frac{\log x \sin(\log x)+1}{x}$ (7M) CO1

UNIT – II

4. (a) Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dx\, dy$ by transforming into polar coordinates. (7M) CO2
   (b) Evaluate $\int\int\int xyz\, dx\, dy\, dz$ over the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$. (7M) CO2

(OR)

5. (a) Change the order of integration in $\int_0^1 \int_x^{\sqrt{x}} xy\, dx\, dy$ and hence evaluate the integral. (7M) CO2
   (b) Evaluate $\int\int r^3\, dr\, d\theta$ over the area included between the circles $r = 2\sin\theta$ and $r = 4\sin\theta$. (7M) CO2

UNIT – III

6. (a) Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 39$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z + 52 = 0$ at the point (4, -3, 2) (7M) CO3
   (b) Prove that the function $f(z) = \sqrt{xy}$ is not analytic at the origin even though the C-R equations are satisfied there at. (7M) CO3

(OR)

7. State and verify Gauss divergence theorem for $\bar{f} = (x^3 - yz)i - 2x^2yj + zk$ taken over the surface of the cube bounded by the planes $x = y = z = a$ and coordinate planes CO3

UNIT – IV

8. (a) If u(x, y) and v(x, y) are harmonic functions in a region R, prove that the function $\left(\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}\right) + i\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ is an analytic function. (7M) CO4

(b) Find the value of 'p', if the function $f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{px}{y}\right)$ is analytic. (7M) CO4

(OR)

9. (a) Evaluate $\oint_C \frac{e^z dz}{(z+1)^2}$, where C is the circle $|z - 3| = 3$ (7M) CO4

(b) Evaluate $\oint_C \frac{(2z+1)^2 dz}{z^8(4z^3+z)}$ over a unit circle C. (7M) CO4

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CE/EC/ME121 (R20)

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Hall Ticket Number:

CE/EC/ME121(R20)

B.TECH. DEGREE EXAMINATION, OCTOBER-2022

Semester II [First Year] (Regular & Supplementary)

MATHEMATICS-II

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Write Linear differential equation of first order in y. CO1
   - (b) Write the condition for exact differential equation. CO1
   - (c) Solve $\frac{ydx - xdy}{x^2 + y^2} = 0$ CO1
   - (d) Solve $(D-2)^2 y = 0$ CO1
   - (e) Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\, dy\, dx$ CO2
   - (f) Change of order of integration in CO2
     $$\int_{-a}^{a} \int_0^{\sqrt{a^2-y^2}} f(x, y)\, dx\, dy$$
   - (g) Evaluate $\int_0^1 \int_0^2 \int_0^3 xyz\, dz\, dy\, dx$ CO2
   - (h) State Green's theorem in a plane. CO3
   - (i) Evaluate $\int_c \bar{r}.d\bar{r}$ where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ CO3
   - (j) Define analytic function. CO3
   - (k) Write the formula for $f'(z)$ when $f(z) = u(x, y) + i v(x, y)$. CO3
   - (l) Define Harmonic function. CO4

(m) Evaluate $\int_c z^2 dz$ where c is the straight line from $z = 0$ to $z = 2 + i$. CO4

(n) State Cauchy's integral formula. CO4

UNIT – I

2. (a) Solve $(x+y+1)\frac{dy}{dx}=1$. (7M) CO1

(b) Solve $2xydy-\left(x^2+y^2+1\right)dx=0$. (7M) CO1

(OR)

3. (a) Solve $y''-6y'+9y=\frac{e^{3x}}{x^2}$ using method of variation of parameters. (7M) CO1

(b) Solve $x^2y''+xy'+9y=\sin(3\log x)$. (7M) CO1

UNIT – II

4. (a) By changing the order of integration, evaluate $\int_0^{16}\int_{\sqrt{x}}^{4} \cos y^3 \, dy \, dx$. (7M) CO2

(b) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-\left(x^2+y^2\right)} dy\, dx$ by changing to polar coordinates. (7M) CO2

(OR)

5. (a) Find the area lying inside the cardioid $r=a(1+\cos\theta)$ and outside the circle $r=a$. (7M) CO2

(b) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z} (x+y+z)\, dy\, dx\, dz$. (7M) CO2

UNIT – III

6. Verify Gauss divergence theorem for the field $\overline{F} = x^3\overline{i} + y^3\overline{j} + z^3\overline{k}$ taken over the cube bounded by $0 \le x \le a,\ 0 \le y \le a,\ 0 \le z \le a$. CO3

(OR)

7. (a) Show that the function $f(z)$ defined by $f(z) = \begin{cases} \frac{xy^2(x+iy)}{x^2+y^4}, & z \ne 0 \\ 0, & z = 0 \end{cases}$ is not analytic at the origin. (7M) CO3

   (b) Determine p such that $f(z) = \frac{1}{2}\log(x^2+y^2) + i\tan^{-1}\left(\frac{px}{y}\right)$ be an analytic function. (7M) CO3

UNIT – IV

8. (a) If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant. (7M) CO4

   (b) Show that the function $u = \frac{1}{2}\log(x^2+y^2)$ is harmonic and find its harmonic conjugate. (7M) CO4

(OR)

9. (a) Verify Cauchy's theorem for the function $f(z) = 3z^2 + iz - 4$ if c is the square with vertices at $1 \pm i$ and $-1 \pm i$. (7M) CO4

   (b) Evaluate $\int_c \frac{\log z}{(z-1)^3}dz$ where $c : |z-1| = \frac{1}{2}$ using Cauchy's integral formula. (7M) CO4

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CE/EC/ME121(R20)

Hall Ticket Number: file-2

CE/EC/ME121(R20)

B.TECH. DEGREE EXAMINATION, FEBRUARY-2022

Semester II [First Year] (Supplementary)

MATHEMATICS-II

Time: Three hours — Maximum Marks: 70

Answer Question No.1 compulsorily. $(14 \times 1 = 14)$
Answer One Question from each unit. $(4 \times 14 = 56)$

1. Answer the following:
   - (a) Write Bernoulli's equation. CO1
   - (b) Determine whether $y(1+xy)dx+(4y-x)dy=0$ is exact or not. CO1
   - (c) Solve $(D^2+1)\,y=0$. CO1
   - (d) Find the integrating factor for $\cos^2 x\frac{dy}{dx}+y=\tan x$ CO1
   - (e) Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$ CO2
   - (f) Evaluate $\int_0^{\pi}\int_0^{a\sin\theta} r\,dr\,d\theta$ CO2
   - (g) Evaluate $\int_1^2\int_1^3\int_1^4 xy^2z\,dxdydz$ CO2
   - (h) Change the following integral into polar form $\int_0^{2a}\int_0^{\sqrt{2ax-x^2}} dxdy$ CO2
   - (i) State Gauss divergence theorem. CO3
   - (j) If S is a closed surface enclosing a volume V and if $\mathbf{R}=x\mathbf{i}+y\mathbf{j}+z\mathbf{k}$ then write the value of $\int_S R.N\,ds$ CO3
   - (k) Write C-R equations in polar form. CO3

(l) Define Harmonic function. CO4

(m) Evaluate $\int_0^{2+i} \bar{z}\, dz$ along the line y = x / 2. CO4

(n) State Cauchy's integral formula. CO4

UNIT – I

2. (a) Solve $\frac{dx}{dy} - \frac{x}{y} = 2y^2$. (7M) CO1

   (b) Solve $(x^2y-2xy^2)\,dx-(x^3-3x^2y)\,dy = 0$. (7M) CO1

(OR)

3. (a) Using method of variation of parameters solve $y'' + 4y = \tan 2x$. (7M) CO1

   (b) Solve $x^2y'' + xy' + y = \log x \sin(\log x)$. (7M) CO1

UNIT – II

4. (a) Evaluate $\int_0^1 \int_{e^x}^{e} \frac{dx\,dy}{\log y}$ by changing the order of integration. (7M) CO2

   (b) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing to polar coordinates. (7M) CO2

(OR)

5. (a) Find the area lying between the parabola $y = 4x - x^2$ and the line y = x. (7M) CO2

   (b) Find the volume bounded by the xy-plane, the cylinder $x^2 + y^2 = 1$ and the plane x + y + z = 3. (7M) CO2

UNIT – III

6. Verify Green's theorem for $\int_C \left[(3x-8y^2)dx+(4y-6xy)dy\right]$ where C is the boundary of the region bounded by $x=0$, $y=0$ and $x+y=1$. CO3

(OR)

7. (a) If w = logz, find dw/dz and determine where w is non-analytic. (7M) CO3

   (b) Show that $\frac{\partial^2 u}{\partial r^2}+\frac{1}{r}\frac{\partial u}{\partial r}+\frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2}=0$ (7M) CO3

UNIT – IV

8. (a) Find the analytic function f(z), whose real part is sin2x / (cosh2y – cos2x). (7M) CO4

   (b) Find the harmonic conjugate of $v(r,\theta) = r^2\cos 2\theta - r\cos\theta + 2$. (7M) CO4

(OR)

9. (a) Evaluate $\int_C (z-z^2)dz$ where C is the upper half of the circle $|z| = 1$. (7M) CO4

   (b) Evaluate $f(2)$ and $f(3)$ where $f(a)=\int_C \frac{2z^2-z-2}{z-a}dz$ and C is $|z| = 2.5$ (7M) CO4

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CE/EC/ME121(R20)

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Hall Ticket Number:

CE/EC/ME121(R20)

B.TECH. DEGREE EXAMINATION, OCTOBER-2021

Semester II [First Year] (Regular)

MATHEMATICS-II

Time: Three hours　　　　　　　　　　　　Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   - (a) Write the Leibnitz's form of linear equation. CO1
   - (b) Find the integrating for the differential equation $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$ CO1
   - (c) Solve $(D^2+2D+5)y=0$ CO1
   - (d) Write the general form of Cauchy's equation. CO1
   - (e) Change the order of integration in $\int_0^1\int_{x^2}^{2-x} xy\,dy\,dx$ CO2
   - (f) Evaluate $\int_0^5\int_0^{x^2} xy\,dy\,dx$ CO2
   - (g) Evaluate $\int_0^3\int_0^2\int_0^1 xyz\,dz\,dx\,dy$ CO2
   - (h) State Stokes' theorem. CO3
   - (i) State Gauss divergence theorem. CO3
   - (j) Write C-R equations. CO3
   - (k) Define Harmonic function. CO4
   - (l) State Milne Thomson method. CO4
   - (m) State Cauchy's theorem. CO4
   - (n) Evaluate $\oint_C \frac{Sin\,z}{\left(z-\frac{\pi}{3}\right)^4}dz$ where $\underline{C}$ is the circle $|z| = 1$ CO4

UNIT – I

2. (a) Solve $\cosh x\dfrac{dy}{dx}+y\sinh x=2\cosh^2 x\sinh x$ (7M) CO1

   (b) Solve $\left(D^2-4\right)y=x\cosh x$ (7M) CO1

(OR)

3. (a) Solve $\left(2x^3y^2+4x^2y+2xy^2+xy^4+2y\right)dx+2\left(y^3+x^2y+x\right)dy=0$ (7M) CO1

   (b) Solve $(D^2+1)y=cosec\ x$ (7M) CO1

UNIT – II

4. (a) Change the order of integration in $I=\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}}dydx$ and hence evaluate. (7M) CO2

   (b) Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z=4$ and $z=0$. (7M) CO2

(OR)

5. (a) Find the area lying inside the circle $r=a\sin\theta$ and outside the cardioid $r=a(1-\cos\theta)$. (7M) CO2

   (b) Find the volume of the tetrahedron bounded by the coordinate planes and the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$. (7M) CO2

UNIT – III

6. Verify Stoke's theorem for the vector field $\bar{F}=\left(x^2-y^2\right)\bar{i}+2xy\,\bar{j}$ over the box bounded by the planes $x=0$, $x=a$, $y=0$, $y=b$, $z=0$, $z=c$ if the face $z=0$ is cut. CO3

(OR)

7. (a) Show that the function $f(z)=\sqrt{|xy|}$ is not analytic at the origin even though Cauchy Riemann equations are satisfied thereof. (7M) CO3

(b) If $f(z)$ is an analytic function of z, then prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|\text{Re}.f(z)|^2 = 2|f'(z)|^2$ (7M) CO3

UNIT – IV

8. (a) Determine the analytic function whose real part is $e^x\left[\left(x^2-y^2\right)\cos y - 2xy\sin y\right]$ (7M) CO4

(b) Evaluate $\oint_C \frac{e^z}{z^2+\pi^2}dz$ where C is $|z| = 3.5$ (7M) CO4

(OR)

9. (a) Find the analytic function $f(z) = u + iv$ if $u - v = (x-y)\left(x^2+4xy+y^2\right)$ (7M) CO4

(b) Evaluate $\oint_C \frac{e^{2z}}{(z+1)(z-2)}dz$ where C is $|z| = 2.5$ (7M) CO4

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