CODE NO. : H–1186–2013

(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

F.Y.B.Tech.(All) EXAMINATION

MAY/JUNE, 2013

ENGINEERING MATHEMATICS-II

Time-Three Hours Maximum Marks-80

''Please check whether you have got the right question paper.''

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.**2,3,4** and **5**

(iii) From section B solve any two section questions from the remaining Q.No.**7,8,9** and **10**

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve the following 10

(a) Evaluate: $\int_0^{2\pi} sin^4 x \; cos^6 x \; dx$

(b) Find the value of a_0 in the Fourier series for $f(x) = \frac{1}{2}(\pi - x)$ in $0 < x < 2\pi$

(c) In a given Fourier series, find the value of a_0

$$f(x) = 1 - \frac{2x}{\pi} \;, -\pi \le x \le 0$$

$$= 1 + \frac{2x}{\pi} \;,\; 0 \le x \le \pi$$

(d) Evaluate: $\int_0^1 \int_0^{1-x} (x + y)\, dx\, dy$

(e) In the surface of solid generated by revolution of the loop of the curve $x = t^2, y = t - \frac{t^3}{3}$

then $\frac{ds}{dt} = \cdots$

2. (a) Evaluate: $\int_0^1 \int_0^y xy\, e^{-x^2}\, dx\, dy$ 5

(b) Obtain Fourier series expansion of $x\, cosx$ in the range $(-\pi, \pi)$ 5

(c) Evaluate: $\int_0^\infty x^2 e^{-x^4} dx \int_0^\infty e^{-x^4}\, dx$ 5

3. (a) Change the order of integration by showing the region of integration

$$\int_{-a}^{a} \int_0^{\sqrt{a^2-x^2}} f(x, y)\, dx\, dy$$ 5

(b) Find Fourier series:

$f(x) = a \quad , \quad 0 < x < \pi$

$\quad = -a, \quad \pi < x < 2\pi$ 5

(c) Evaluate: $\int_0^1 x^5\, (1 - x^5)^{\,10}\, dx$ 5

4. (a) Evaluate: $\int_0^\infty \frac{y^8(1-y^6)}{(1+y)^{\,24}}\, dy$ 5

(b) Evaluate $\iint \sin[\pi(ax + by)]\, dx\, dy$ over the area of a triangle bounded by

$x = 0, y = 0$ and $ax + by = 1.$ 5

(c) Find half range sine series for $f(x)$

$f(x) = \frac{x}{2}, 0 < x < \alpha$

$\quad = \frac{\alpha}{2}, \alpha < x < \pi - \alpha$

$\quad = \frac{1}{2}(\pi - x), \quad \pi - \alpha < x < \pi$ 5

5 (a) Evaluate: $\int_0^{\pi/2} \int_0^{a\, sin\theta} \int_0^{\frac{a^2-r^2}{a}} r\, dr\, d\theta\, dz$ 5

(b) Find half range cosine series for $f(x) = sinx$ in $0 < x < \pi$ 5

(c) By double integration, find the area enclosed by $y^2 = \frac{x^2(a^2-x^2)}{a^2+x^2}$ 5

Section B

6. Solve the following 10

(a) In the cycloid curve $x = a(\theta - sin\theta)$ and $y = a(1 + cos\theta)$ find $\frac{dy}{dx}$

(b) Find the asymptote foe a curve $x(x^2 + y^2) = a(x^2 - y^2)$

(c) Define linear differential equation.

(d) Define centre of curvature.

(e) Find integral factor for the equation $\frac{dy}{dx} + x^2y = x^5$

7.(a) Trace the curve $r = a(1 + cos\theta)$

(b) Solve: $\frac{dy}{dx} + xy = xy^3$

(c) Show that radius of curvature at the point $(-2a, 2a)$ on the curve $x^2y = a(x^2 + y^2)$ is $2a$.

8.(a) Trace the curve $y^2(x^2 + a^2) = x^2(a^2 - x^2)$ with full justification. 5

(b) Solve: $(1 + y^2) + \left(x - e^{tan^{-1}y}\right)\frac{dy}{dx} = 0$ 5

(c) Determine the radius of curvature at the origin for the curve

$x^3y - xy^3 + 2x^2y + xy - y^2 + 2x = 0$ 5

9.(a) Trace the curve: $x = a(\theta - sin\theta), y = a(1 - cos\theta)$ 5

(b) Show that the radius of curvature at any point of the curve $x^{2/3} + y^{2/3} = a^{2/3}$ is equal to three times the length of the perpendicular from the origin to the tangent at the point. 5

(c) A particle of mass m under gravity in a medium whose resistance is k times its velocity, where k is constant. If the particle projected vertically upwards with velocity V, show that the time to reach the maximum height is $\frac{m}{k}\ Log[\,1 + \frac{kv}{mg}\,]$ 5

10. (a) Find orthogonal trajectory of the curve $r^n = a^n \, sinn\theta$ 5

(b) Find the length of the arc of the curve $ay^2 = x^3$ from the vertex to the point whose abscissa is b. 5

(c) when a resistance R ohms is connected in a series with an inductance L, henries emf E volts, the current i builds up at the rate given by the equation: $L\frac{di}{dt} + Ri = E$, $i(0) = 0$ given that if $L = 0.05, R = 100$ and $E = 200\cos(300t)$ 5

CODE NO. : P–1001–2013

(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

F.Y.B.Tech.(All) EXAMINATION

NOVEMBER/DECEMBER, 2013

ENGINEERING MATHEMATICS-II

Time-Three Hours Maximum Marks-80

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(iii) From section B solve any two section questions from the remaining Q.No.**7,8,9** and **10**

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (Each for two marks) 10

(a) Find: $\Gamma\frac{7}{2}$

(b) Prove that: $\beta(m,n) = \beta(m,n+1) + \beta(m+1,n)$

(c) Evaluate: $\int_0^\infty \frac{x^8(1-x^6)}{(1+x)^{24}}\,dx$

(d) Evaluate: $\int_0^1 \int_x^{2x} x\,dx\,dy$

(e) For: $\int_0^1 \int_x^{2x} dxdy$ show the region of integration.

(f) Write formula to find surface area of the solid of revolution, if the area bounded by the curve $y = f(x), x = a\,, x = b$ revolves about x-axis.

(g) Half range cosine series is obtained by $f(x) =$ ………… (Write formula)

(h) Check whether the function is even or odd

$$f(x) = 1 + \frac{2x}{\pi}, -\pi \le x \le 0$$

$$= 1 - \frac{2x}{\pi}, 0 \le x \le \pi$$

Justify your answer.

2. (a) Evaluate: $\int_0^1 x^3 \left(1-\sqrt{x}\right)^5 dx$ 5

(b) Evaluate: $\iint xy\,(x+y)dx\,dy$ over the area between $y = x^2$ and $y = x$ 5

(c) Find sine series to represent $f(x)$ between $x = 0$ and $x = l$ where

$$f(x) = x, 0 \le x \le \frac{l}{3}$$

$$= \frac{1}{2}(l-x), \frac{l}{3} \le x \le l$$ 5

3. (a) Evaluate: $\int_0^{\pi/2} \sqrt{cot\theta}\ d\theta$ 5

(b) Find the area of the curve $r^2 = a^2 cos2\theta$ 5

(c) Find the Fourier series for:

$$f(x) = -x^2, -\pi < x < 0$$

$$= x^2, 0 < x < \pi$$ 5

4. (a) Prove that: $\int_1^{\infty} \frac{x^{\frac{n}{2}-1}}{(1+x)^n} = \frac{1}{2}\ \beta\left(\frac{n}{2}, \frac{n}{2}\right)$ 5

(b) Change the order of integration $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y} dy\,dx$ and hence evaluate. 5

(c) Obtain Fourier series

$$f(x) = 0, -\pi \le x \le 0$$

$$= \frac{\pi}{4}x,\ 0 \le x \le \pi$$ 5

5 (a) Find the surface area formed by the revolution of the cycloid:

$x = a(\theta + sin\theta)$, $y = a(1 - cos\theta)$ about tangent and its vertex. 5

(b) Evaluate: $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dx\, dy\, dz$ 5

(c) Expand $(\pi x - x^2)$ as a cosine series for $0 < x < \pi$ 5

Section B

6. Solve any five (Each for two marks) 10

(a) For the curve $y = c\, cosh\frac{x}{c}$ find $\frac{dy}{dx}$ hence find the equation of tangent at $(0, c)$

(b) Find the equation of the asymptote to the curve: $y(x^2 - 1) = x$

(c) Curve $r = a\, sin3\theta$ is symmetrical about ………… Justify your answer.

(d) Define solution of differential equation.

(e) Find the integrating factor for differential equation: $R\frac{dQ}{dt} + \frac{Q}{C} = V$

(f) $\frac{dy}{dx} + \frac{ycosx+siny+y}{sinx+xcosy+x} = 0$ is exact? Justify your answer.

(g) Radius of curvature for the curve $y = f(x)$ is obtained by $\rho =$………..

(h) If y-axis is the tangent to the curve at the origin then $\rho_0 =$……………

7. (a) Trace the curve: $y(x^2 + 4a^2) = 8a^3$ with full justification

(b) Solve: $x\, dy = \{y + xy^3(1 + Logx)\}dx$

(c) Prove that the chord of curvature through the pole for: $r = ae^{m\theta}$ is $2r$

8. (a) Find the whole length of the curve: $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ 5

(b) Find the orthogonal trajectory of the family of the curve: $r^n = a^n\, cosn\theta$ 5

(c) Find the radius of curvature for $r = a(1 + cos\theta)$ 5

9. (a) Trace the curve $x = t^2$, $y = t(1 - \frac{t^2}{3})$ with full justification. 5

(b) A constant emf E volts is applied to an electrical circuit containing resistance R and inductance L in series. If the initial current is zero show that the time for current to build up to half of its maximum is: $\frac{L\,log2}{R}\ sec.$ 5

(c) Find the radius of curvature at the origin for the curve:

$x^3 - 2x^2y + 3xy^2 - 4y^3 + 5x^2 - 6xy + 7y^2 - 8y = 0$ 5

10. (a) Trace the curve $r^2 = a^2\ cos2\theta$ with full justifiacation. 5

(b) A particle falls in a vertical line under gravity and air resistance to its motion is proportional to its velocity and distance as function of t.shoow that the velocity V will never exceed $\frac{g}{k}$ 5

(c) Solve: $\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0$ 5

CODE NO. : K–1220–2014

(Revised Course)

FACULTY OF ENGINEERING AND TECHNOLOGY

F.Y.B.Tech.(All) EXAMINATION

MAY/JUNE, 2014

ENGINEERING MATHEMATICS-II

Time-Three Hours Maximum Marks-80

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(ii) From section A solve any two section questions from the remaining Q.No.**2,3,4** and **5**

(iii) From section B solve any two section questions from the remaining Q.No.**7,8,9** and **10**

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (Each for two marks) 10

(a) Find the value of $\frac{\Gamma\frac{5}{2}\,\Gamma\frac{3}{2}}{\Gamma 4}$

(b) Prove that: $\beta(m,n) = \beta(m,n+1) + \beta(m+1,n)$

(c) Evaluate: $\int_0^1 x^3(1-x)^4 dx$ by using beta function.

(d) Evaluate: $\int_0^1 \int_1^2 dx\, dy$

(e) For: $\int_0^1 \int_x^{2x} dxdy$ show the region of integration.

(f) Find the limits of integration to evaluate $\iint y\, dx\, dy$ over the area of the circle:

$x^2 + y^2 = 1$ when the strip is drawn parallel to y-axis.

(g) Find a_0 for the Fourier series for: $f(x) = e^{-ax}$ in $0 < x < 2\pi$

(h) Find a_0 for $f(x) = \frac{\pi^2}{12} - \frac{x^2}{4}$ in $-\pi \leq x \leq \pi$

2. (a) Evaluate: $\int_0^\infty \frac{y^4}{4^y}\, dy$ 5

(b) Evaluate: $\int (x^2 - y^2) dA$ over the area of the triangle whose vertices are at the points $(0,1), (1,1)$ and $(1,2)$ 5

(c) Expand e^x as a cosine series in $(0, l)$ 5

3. (a) Evaluate: Evaluate: $\int_0^\infty \frac{dx}{1+x^4}$ 5

(b) Find by double integration the area of the asteroid: $x = a\cos^3\theta, y = a\sin^3\theta$ 5

(c) Find the Fourier series for: $f(x) = \frac{x(\pi^2 - x^2)}{12}$ in $(-\pi, \pi)$ 5

4. (a) Prove that: $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}\, dx$ 5

(b) Change to polar and evaluate: $\iint x^3 dx\, dy$ over the interior of the circle $x^2 + y^2 - 2ax = 0$ 5

(c) Find Fourier series of $f(x) = a,\ 0 \leq x \leq \pi$

$= -a, \pi \leq x \leq 2\pi$ 5

5 (a) Find the surface of the solid generated by the revolution of the lemniscates $r^2 = a^2\cos 2\theta$ about initial line. 5

(b) Evaluate: $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dx\, dy\, dz$ 5

(c) Find the Fourier series for: $f(x) = x^2 - 2, -2 \leq x \leq 2$ 5

Section B

6. Solve any five (Each for two marks) 10

(a) For the curve $r = a\cos 2\theta$ find the equation of the tangents at the pole.

(b) Curve: $x = a(\theta - \sin\theta), y = a(1 + \cos\theta)$ is symmetrical about ………………… axis.

Justify your answer.

(c) Find the point of intersection with x-axis. Also find the equation of the tangents at the point of intersection for the curve: $y^2(4-x) = x(x-2)^2$

(d) Define exact differential equation.

(e) Find integrating factor (I.F.) of : $L\frac{di}{dt} + Ri = E$

(f) Reduce it to linear form: $\frac{dy}{dx} = x^3y^3 - xy$

(g) Find the centre of curvature of: $y = x^3 - 6x^2 + 3x + 1$ at $(1, -1)$

(h) Write formula for ρ when the curve is given by its pedal equation.

7. (a) Trace the curve $y^2(a+x) = x^2(3a-x)$ 5

(b) Solve: $(1+y^2)dx = (tan^{-1}y - x)dy$ 5

(c) Find the chord of curvature through the pole for: $r^m = a^m cosm\theta$ 5

8. (a) Show that in the catenary $y = c\cosh\left(\frac{x}{c}\right)$ the length of the arc from vertex to any point is $s = c\sinh\left(\frac{x}{c}\right)$ 5

(b) Find the orthogonal trajectories of the family of the curve: $\frac{l}{r} = 1 + cos\theta$ 5

(c) For the curve $r^2 = a^2cos2\theta$ prove that $\rho = \frac{a^2}{3r}$ 5

9. (a) Trace the curve $x = a\,cos^3\theta$, $y = a\,sin^3\theta$ with full justification. 5

(b) The equation of the electromotive force in terms of current i for an electrical circuit having resistance R , and a condenser of capacity C in series is : $E = Ri + \int\frac{i}{C}\,dt$

Find the current i, when $E = E_m\,sin\omega t$. 5

(c) Find the radius of curvature at the origin for the curve: 5

$2x^4 + 2y^4 + 4x^2y + xy - y^2 + 2x = 0$

10. (a) Trace the curve $r = 2 + 3\ cos\theta$ with full justification. 5

(b) A moving body is opposed by a force per unit mass of value cx and resistance per unit mass of value $bv^{2,}$ where x and v are the displacement and velocity of the particle if it starts from rest is given by :

$v^2 = \frac{c}{2b^2}\ (1 - e^{-2bx}) - \frac{cx}{b}$ 5

(c) Solve: $\frac{dy}{dx} = -\left(\frac{x+y\ cosx}{1+sinx}\right)$ 5

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(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

F.Y.B.Tech.(All) EXAMINATION

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ENGINEERING MATHEMATICS-II

Time-Three Hours Maximum Marks-80

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(ii) From section A solve any two section questions from the remaining Q.No.2,3,4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7,8,9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (Each for two marks) 10

(a) Define beta function.

(b) Find $\left\lceil \frac{9}{2} \right.$

(c) Evaluate: $\int_0^1 \int_0^2 (x^2 + y^2)\, dy\, dx$

(d) Change the order of integration: $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\, dx\, dy$

(e) Change to the polar coordinates: $\int_0^a \int_{\sqrt{ax-x^2}}^{\sqrt{a^2-x^2}} \frac{dx\, dy}{\sqrt{a^2-x^2-y^2}}$

(f) Define Dirichlet’s condition

(g) Check whether the function is even or odd

$f(x) = \pi + x\ , -\pi < x < 0$

$= \pi - x\ , 0 < x < \pi$

(h) Find half range cosine series in $(0, \pi)$ of $f(x) = 2$

2. (a) Prove that: $\beta(m, n) = \int_0^\infty \frac{t^{m-1}}{(1+t)^{\,m+n}}\, dt$

(b) Change the order of integration and hence evaluate it $\int_0^a \int_{\frac{x}{a}}^{\sqrt{\frac{x}{a}}} (x^2 + y^2) dx\, dy$

(c) Find the Fourier series for the function $f(x) = 2x - x^2$ in the range (0,3)

3. (a) Evaluate: $\int_0^\infty \sqrt{x}\ e^{-x^{1/3}}\, dx$

(b) Change the order of integration and evaluate $\int_0^1 \int_{x^2}^{2-x} xy\, dx\, dy$

(c) Find the half range cosine series for $f(x) = sinx\ , 0 < x < \pi$ and hence deduce that

$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

4. (a) Evaluate: $\int_3^7 \sqrt[4]{(7 - x)(x - 3)}\ dx$

(b) Evaluate: $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dx\, dy\, dz$

(c) Find Fourier series of $f(x) = \pi^2 - x^2$ in the interval $-\pi < x < \pi$

5.(a) Find the area between the curve $y^2 = \frac{x^3}{a-x}$ and $x = a$ asymptote.

(b) Find by double integration the area common to $x^2 + y^2 = a^2$ and

$x^2 + y^2 - 2ax = 0$

(c) Obtain Fourier series expansion of the function

$f(x) = 1 - \frac{2x}{\pi}\ , -\pi \le x \le 0$

$= 1 + \frac{2x}{\pi}\ ,\ 0 \le x \le \pi$

Section B

6. Solve any five (Each for two marks) 10

(a) Find the equation of asymptote to the curve $y^2(a-x)=x^2$

(b) Write formula for length of Cartesian curve $S=$ …………….

(c) Curve $r=a\ sin3\theta$ is symmetric about …………….

(d) Write equation for L-R circuit.

(e) In exact differential equation, condition for exact is ………………

(f) If $y^2\frac{dx}{dy}+xy=2y^2+1$ then $I.F.=$ ……………..

(g) Radius of curvature for the curve $x=f(y)$ is obtained by $\rho=$ ………..

(h) If x-axis is the tangent to the curve at origin, then $\rho_0=$…………….

7. (a) Trace the curve $a^2y^2=x^2(a^2-x^2)$ with full justification.

(b) Solve: $cos\ ^2x\ \frac{dy}{dx}+y=tanx$

(c) Find the radius of curvature to the curve $r^n=a^n sinn\theta$

8. (a) Trace the curve $=a+b\ cos\theta$, when $a>b$

(b) Solve: $\frac{dy}{dx}+\frac{ycosx+siny+y}{sinx+xcosy+x}=0$

(c) Show that radius of curvature at any point (x , y) of the hypocycloid $x^{2/3}+y^{2/3}=a^{2/3}$ is three times the length of perpendicular from the origin to the tangent at (x, y).

9. (a) Trace the curve $x=a(\theta+sin\theta),y=a(1+cos\theta)$

(b) Find the orthogonal trajectory of the family of curves $r=a(1-cos\theta)$

(c)Find the radius of curvature at the origin for the curve:

$$x^4-y^4+x^3-y^3+x^2-y^2+y=0$$

10. (a) Find the whole length of the loop of the curve $3ay^2 = x(x-a)^2$

(b) Show that the differential equation for current i in an electric circuit containing an inductance L and resistance R in series and acted on by e.m.f. $sin\omega t$ is $\frac{di}{dt} + \frac{R}{L}\, i = \frac{E}{L}\, sin\omega t$ Find current i at any time t, if initially there is no current in the circuit.

(c) Solve: $\frac{dy}{dx} = 2y\, tanx + y^2 tan^2 x$

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(Revised Course)

FACULTY OF ENGINEERING AND TECHNOLOGY

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MAY/JUNE, 2015

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(v) Assume suitable data if necessary.

Section A

1. Solve any five (Each for two marks) 10

(a) Define Gamma function.

(b) Find: $\int_0^{\pi/4} \cos^3 2t \ \sin^2 4t \ dt$

(c) Evaluate: $\int_0^3 \int_0^1 (x^2 + 3y^2)\, dy\, dx$

(d) Change the order of integration: $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y\, dx\, dy}{(1+y^2)\sqrt{(1-x^2-y^2)}}$

(e) Change to polar coordinates: $\iint_R \sqrt{x^2+y^2}\ dx\, dy$ where R: $x^2 + y^2 = 4$

(f) Half range sine series is obtained by $f(x) = \ldots\ldots\ldots\ldots$ (Write formula).

(g) If function is even, then Fourier series $f(x) =$ ……………..

(h) Find Fourier sine series of x over $(0,1)$

2. (a) Prove that: $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}} dx = \frac{1}{a^n b^m}\, \beta(m,n)$ 5

(b) Evaluate: $\int_0^a \int_y^b \frac{x^2}{(x^2+y^2)^{1/2}} dx\, dy$ by changing the order of integration. 5

(c) Obtain the Fourier expansion of: $f(x) = cosax$ in the range $(0,2\pi)$ 5

3. (a) Evaluate: $\int_0^\infty \sqrt[4]{t}\; e^{-\sqrt{t}}\, dx$ 5

(b) Change the order of integration and evaluate: $\int_0^1 \int_y^{\sqrt{y}} xy\, dx\, dy$ 5

(c) Find half range cosine series for: $f(x) = \pi - x\,,\; 0 \le x \le \pi$ 5

4. (a) Evaluate: $\int_0^{\pi/2} \sqrt{cos\theta}\; d\theta$ 5

(b) Evaluate: $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\, dx\, dy\, dz$ 5

(c) Find the Fourier series to represent the function$f(x) = |x|$ in the interval $-\pi < x < \pi$ 5

5 (a) Find the area between the curve: $y^2 = \frac{a^2 x}{a-x}$ and its asymptote. 5

(b) Show that the surface area of the sphere generated by the revolution of the upper part of the circumference of the circle $x^2 + y^2 = a^2$ about x-axis is $4\pi a^2$ 5

(c) Find Fourier series for: $f(x) = a\,,\; 0 < x < \pi$

$$= -a\,, \pi < x < 2\pi$$ 5

Section B

6. Solve any five (Each for two marks) 10

(a) Find the equation of asymptote to the curve: $y^2(a-x) = x^2(a+x)$

(b) Write a formula of length of parametric curve $s =$ …………..

(c) Curve $r = a + b\, cos\theta\,, a < b$ symmetric about …………….

(d) Write a equation for R-C circuit.

(e) $\frac{dy}{dx} = \frac{y+1}{(y+2)e^y - x}$ is exact differential equation. Justify your answer.

(f) Find I.F. of: $\frac{dy}{dx} + x^2 y = x^5$

(g) Write formula for chord of curvature.

(h) Radius of curvature for the curve $y = f(x)$ is obtained by $\rho =$………..

7. (a) Trace the curve: $a^4 y^2 = x^5(2a - x)$ giving full justification. 5

(b) Solve: $y^2 \frac{dx}{dy} + xy = 2y^2 + 1$ 5

(c) Find the centre of circle of curvature for: $xy(x + y) = 2$ at (1, 1) 5

8. (a) Trace the curve $r = a\ sin3\theta$ with full justification. 5

(b) Solve: $\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0$ 5

(c) Show that radius of curvature at any of the curve: $x^{2/3} + y^{2/3} = a^{2/3}$ is to equal three times the length of perpendicular from the origin to the tangent at that point. 5

9. (a) Trace the curve $x = a\ cos\ ^3t$, $y = a\ sin\ ^3t$ with full justification. 5

(b) Find the orthogonal trajectory of the family of the curve: $x^2 + y^2 = 2ax$ 5

(c) Find the radius of curvature at the origin for the curve:$y^2 - 3xy + 2x^2 - x^3 + y^4 = 0$ 5

10. (a) Find the total length of the cycloid $x = a(\theta + sin\theta), y = a(1 - cos\theta)$ 5

(b) In an electric circuit containing resistance R , an inductance L,the voltage and current i are connected by equation : $L\frac{di}{dt} + Ri = E$. If L $= 540$, $R = 150$, $E = 300$ and $i = 0$ when $t = 0$.Show that current will approach 2 amps as t increases. Also find in how many seconds i will approach 90% of the maximum value. 5

(c) Solve: $r\ sin\theta - \frac{dr}{d\theta}\ cos\theta = r^2$ 5

CODE NO. : K−1101−2015

(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

F.Y.B.Tech. (All) EXAMINATION

NOVEMBER/DECEMBER, 2015

ENGINEERING MATHEMATICS-II

Time-Three Hours Maximum Marks-80

''Please check whether you have got the right question paper.''

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2,3,4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7,8,9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (Each for two marks) 10

(a) Evaluate: $\int_0^{\pi/6} cos^4 3t \; sin^3 6t \; dt$

(b) Define Gamma function.

(c) Evaluate: $\int_1^a \int_1^b \frac{dy\,dx}{xy}$

(d) Change the order of integration: $\int_{-a}^{a} \int_0^{\sqrt{a^2-x^2}} f(x,y)\,dx\,dy$

(e) Change to the polar coordinates: $\iint (1-x^2-y^2)^{1/2}\,dx\,dy$

(f) Define Dirichlet's condition

(g) Check whether the function is odd or even

$f(x) = -x \ , -\pi < x < 0$

$= x \ , 0 < x < \pi$

(h) Half range cosine series is obtained by $f(x) =$ …………

2. (a) Prove that: $\int_a^b (x-a)^m (b-x)^n dx = (b-a)^{m+n+1} \ \beta(m+1, n+1)$ 5

(b) Evaluate: $\int_0^2 \int_{2-\sqrt{4-y^2}}^{2+\sqrt{4-y^2}} \ dx\, dy$ by changing the order of integration. 5

(c) Expand $f(x) = x\, sinx$ in a Fourier series in the interval $0 \le x \le 2\pi$ 5

3. (a) Evaluate: $\int_0^1 (x \text{ logx})^3 \, dx$ 5

(b) Change the order of integration and evaluate: $\int_0^1 \int_x^{2x} dx\, dy$ 5

(c) Find the half range cosine series for $f(x) = sinx \, , 0 < x < \pi$ and hence deduce that 5

$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

4. (a) Evaluate: $\int_0^1 x^5 [1 - x^3]^{10} \, dx$ 5

(b) Evaluate: $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} e^x dx\, dy\, dz$ 5

(c) Find Fourier series of $f(x) = \pi^2 - x^2$ in the interval $(-\pi, \pi)$ and deduce that: 5

$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$

5. (a) Find by double integration the area bounded between the curves $y = x^2$ and $y = 2x + 3$

(b) Find volume of the solid generated by revolution of the curve: $xy^2 = 4(2 - x)$ 5

about y-axis.

(c) Find half range cosine series for: 5

$f(x) = 1 \, , 0 < x < 1$

$= x \ , 1 < x < 2$

Section B

6. Solve any five (Each for two marks) 10

(a) Find the equation of asymptote to the curve: $y^2(a-x)=a^2x$

(b) Write a formula for length of Polar curve $S=$ ……………

(c) Curve $r=a+b\,cos\theta\,, a>b$ symmetrical about ……………

(d) Write an equation for L-R-C circuit.

(e) $y\,dx=(siny-x)dy$ is exact differential equation ?

(f) Find P.I. of: $\frac{dy}{dx}+y\,cotx=5e^{cosx}$

(g) Write a formula for chord of curvature.

(h) Radius of curvature for the curve $y=f(x)$ is obtained by $\rho=$ …………..

7. (a) Trace the curve with full justification: $x^2(x^2+y^2)=a^2(x^2-y^2)$ 5

(b) Solve: $\frac{dy}{dx}+x^2y=x^5$ 5

(c) Find the centre of circle of curvature for: $xy(x+y)=2$ at $(1,1)$ 5

8. (a) Trace the curve $r=a\,cos2\theta$ with full justification. 5

(b) Solve:$\left(y^2+e^{xy^2}+4x^3\right)dx+\left(2xye^{xy^2}-3y^2\right)dy=0$ 5

(c) Find the radius of curvature at any point (r,θ) of the conic section: $\frac{l}{r}=1+e\,cos\theta$ 5

9. (a) Trace the curve $x=a(\theta+sin\theta), y=a(1-cos\theta)$ 5

(b) Find the orthogonal trajectory of the family of curves: $y^2=c(1+x^2)$ 5

(c) Find the radius of curvature at the origin for the curve: 5

$$y^2-3xy+2x^2-x^3+y^4=0$$

10. (a) Find the length of the cardoid: $r = a(1 - cos\theta)$ and show that the upper half of the curve bisected at: $\theta = \frac{2\pi}{3}$ 5

(b) A resistance of 100 ohms, an inductance of 0.5 henry are connected in series with a battery of 20 volts. Find the current in the circuit a function of time. 5

(c) Solve: $\frac{dy}{dx} = x^3y^3 + xy$ 5

Compiled & Collected by
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