Total No. of Printed Pages:3

SUBJECT CODE NO:- H-102
FACULTY OF SCIENCE AND TECHNOLOGY
F. E. (All) (CGPA)
Engineering Mathematics-II
(REVISED)

[Time: Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
i) Questions number 1 and 6 are compulsory.
ii) Solve any two questions from remaining of each section.
iii) Figure to the right indicates full marks.
iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five from the following 10

a) Find the integrating factor of $y(logy)dx + (x - logy)dy = 0$
b) Find the solution of exact differential Equation $(3x^2 + 6xy^2)\,dx + (6x^2y + 4y^3)dy = 0$
c) If $f(x) = \pi^2 - x^2, x \in (-\pi, \pi)$, then find the value of fourier coefficient a_n
d) Define the half range Fourier series in the interval $(0, \pi)$.
e) If $f(x) = x, x \in (0,2\pi)$ then find Fourier coefficient b_n.
f) Find the equation of asymptote to the curve $y^2(x + a) = x^2(3a - x)$.
g) Find the length of an arc curve $y = f(x) from\ x = a\ to\ x = b$.
h) The curve $r = a + bcos\theta$ is symmetrical about……

Q.2
a) Solve $(1 + y^2)dx = (tan^{-1}y - x)dy$. 05
b) Find Fourier series for $f(x) = \frac{\Pi - x}{2}$ in the interval $0 < x < 2\pi$. 05
c) Trace the curve $y^2(a - x) = x^2(a + x)$ with full justification. 05

Q.3
a) Solve $tany\ \frac{dy}{dx} + tanx = cosycos^2x$ 05
b) Obtain the Fourier series for the function $f(x) = \begin{cases} \pi x; 0 \le x \le 1 \\ \pi(2 - x); 1 \le x \le 2 \end{cases}$ 05
c) Trace the curve $x = a\,(\theta + \sin\theta)$; $y = a(1 - cos\theta)$ with full justification. 05

Q.4
a) Solve $\frac{dy}{dx} + \frac{ycosx + \sin y + y}{sinx + x\,cosy + x} = 0$ 05
b) Obtain the Fourier series for the function $f(x) = x\,sinx\ in\ x \in (-\pi, \pi)$ 05
c) Find the perimeter of the loop of the curve $3ay^2 = x\,(x - a)^2$ 05

Q.5

a) Solve $L\frac{di}{dt} + Ri = 200\ cos300t$ 05
When $R = 100\ ohms, L = 0.05\ Henery\ and$
also find i given that i(0) = 0

b) Obtain half Range Fourier Series for $f(x) = (x-1)^2$ in the interval (0,1) 05

c) Find the total length of the cardioid $r = a(1 + cos\theta)$. 05

Section-B

Q.6 Solve any Five from the following 10

a) Write the reduction formula for
$\int_0^{\frac{\Pi}{2}} sin^m x\ cos^n x\ dx$

b) Define Beta Function and
Evaluate $\beta\left(\frac{1}{2}, \frac{3}{2}\right)$

c) Evaluate
$\int_0^{\Pi} \int_0^{a\ sin\theta} r dr d\theta$

d) Evaluate
$\int_0^a \int_0^b \int_0^c xyz\ dx\ dy\ dz$

e) Change the order of integration
$\int_0^1 \int_0^{\sqrt{1-x^2}} f(x,y) dx\ dy$

f) Evaluate
$\int_0^3 \int_0^{1/x} ye^{xy} dxdy$

g) Write
$\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{x}{\sqrt{x^2+y^2}} dx\ dy$

into polar co-ordinate form.

h) The surface area of solid formed the revolution of the curve
$y = f(x) about\ x\ axis\ from\ x = a\ to\ x = b\ is$ ... ...

Q.7 a) Evaluate 05

$$\int_0^1 \frac{dx}{\sqrt{1-x^4}}$$

b) Evaluate 05

$\int_{-2}^{2}\int_{0}^{\sqrt{4-y^2}}(4-y)dx\,dy$

c) By double integration, find the area included between the curve 05
$r = a(sec\theta + cos\theta)$ and its asymptote

Q.8 a) Evaluate 05

$$\int_0^1 x^{n-1}[log\ (1/x)]^{m-1}dx$$

b) Change the order of integration 05

$$\int_0^1 \int_{x^2}^{2-x} f(x,y)dx\,dy \ \ by\ showing\ region$$

c) Calculate the volume of the solid bounded by 05
$x = 0, y = 0, lx + my + nz = 1\ and\ z = 0$

Q.9 a) Prove that 05

$$\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}}dx = \beta\ (m,n)$$

b) By changing into polar co-ordinates evaluate 05

$$\int_0^{1/\sqrt{2}} \int_y^{\sqrt{1-y^2}} \log(x^2 + y^2)\,dx\,dy$$

c) Find the volume bounded by 05
The cylinder $x^2 + y^2 = 4\ and\ y + z = 3\ and\ z = 0$.

Q.10 a) Evaluate 05

$$\int_0^{\infty} \sqrt[4]{x}\, e^{-\sqrt{x}}dx$$

b) Evaluate 05

$$\int_0^{log2} \int_0^{x} \int_0^{x+y} e^{(x+y+z)}dx\,dy\,dz$$

c) Find surface area between the 05
curves $y = 2 - x\ and\ y^2 = 2(2-x)$
by double integration