Total No. of Printed Pages:3

SUBJECT CODE NO:- H-102
FACULTY OF ENGINEERING 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 numbers 1 and 6 are compulsory.
ii) Solve any two questions from remaining of each section.
iii) Figures to the right indicate full marks.
iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five from the following. 10

a) If $\frac{dy}{dx} + py = q$ where p and q are functions of x then its solution…………

b) Reduce the Bernoulli's equation $x\frac{dy}{dx} + y = x^3y^6$ to linear differential equation.

c) Define the Fourier series for $f(x)$in the interval $(c, c + 2\pi)$ and writes its Fourier coefficient.

d) If $f(x) = e^{-x}, x \in (-2, 2)$ then find Fourier coefficient a_0.

e) If $f(x) = x, x \in (0, \pi)$ then find the Half Range Fourier Sine series coefficient b_n.

f) Find the equation of tangent at origin to the curve $ay^2 = x^2(a - x)$

g) The curve $r = a(1 + sin\theta)$ is symmetric about…………….

h) The length of the curve $x = f(t), y = g(t) from\ t = A\ to\ t = B$ is given by…………

Q.2
a) Solve $(3x^2 + 6xy^2)dx + (6x^2y + 4y^3)dy = 0$ 05
b) Obtain the Fourier series for $f(x) = x^2 in\ the\ interval\ (0,2\,\pi)$. 05
c) Trace the curve $x(y^2 + x^2) = a\,(x^2 - y^2)$ with full justification. 05

Q.3
a) Solve $(1 + x^2)\frac{dy}{dx} + y = e^{tan^{-1}x}$ 05

b) Find the half range cosine series for $f(x) = x\,(\pi - x) in\ (0, \pi)$. 05

c) Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$ with full justification. 05

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Q.4 a) A resistance of 100Ω, an inductance of 0.5 henry are connected in series with a battery of 20 volts. Find the current in the circuit at $t = 0.5\,\sec\, if\ i = 0\ at\ t = 0$. 05

b) Find Fourier series $f(x) = \begin{cases} 2, -2 < x < 0 \\ x, \ \ 0 < x < 2 \end{cases}$ 05

c) Trace the curve $r = a(1 + cos\theta)$ with full justification 05

Q.5 a) A body originally at 80°C cools down to 60°C in 20 minutes, the temperature of the air being 40°C. Find the temperature of the body after 40 minutes from the original. 05

b) Find Fourier series for $f(x) = \pi^2 - x^2$ in the interval $(-\pi, \pi)$ 05

c) Find the length of one arch of the cycloid $x = a\ (\theta + sin\ \theta); y = a\ (1 + Cos\theta)$ 05

Section B

Q.6 Solve any five from the following 10

a) Evaluate $\int_0^\infty e^{-x}\, x^3 dx$

b) Evaluate $\int_0^{\Pi/6} Sin^3 3\,\theta\, Cos^7 3\theta d\theta$

c) Evaluate $\int_1^e \int_0^{logy} \frac{1}{logy} dxdy$

d) Evaluate $\int_0^1 \int_0^2 \int_0^3 x\ dxdydz$

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

f) Find the limits for $\int\int xy\ (x + y) dxdy$ over the area between $y = x^2$ and $y = x$.

g) State the formula to find the volume by triple integration.

h) The surface area of the solid formed the revolution of the curve $x = g(y)$ about y-axis from $y = c\ to\ y = d$ is given by …………….

Q.7 a) Evaluate $\int_0^\infty a^{-bx^2} dx$ 05

b) Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \left[\frac{1}{1+x^2+y^2}\right] dxdy$ 05

c) Find the area by double integration between the parabolas $y^2 = 4\ ax\ and\ x^2 = 4ay$. 05

Q.8

a) Evaluate $\int_0^1 x^5[\log(1/x)]^3\ dx$ 05

b) Change the order of integration 05

$\int_0^a \int_{\sqrt{ax}}^a \frac{y^2 dx\, dy}{\sqrt{y^4 - a^2x^2}}$ by showing the region.

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

Q.9

a) Prove that $\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx = \beta(m, n)$ 05

b) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} dzdydx$ 05

c) Find the triple integration, the volume of the sphere $x^2 + y^2 + z^2 = a^2$ 05

Q.10

a) Evaluate $\int_0^{2a} x^2\sqrt{2ax - x^2}\,dx$ 05

b) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\ dx\, dy$ by 05

Changing to polar co-ordinates.

c) Find the surface of the solid generated by revolution of the curve $x = t^2$; $y = t\left(1 - \frac{t^2}{3}\right)$ about $x - axis$. 05