Marking Scheme and solution U239-131A-(T1)

ENGINEERING MATHEMATICS III E&TC

COURSE CODE: ES20181ET

Q 1)

a) Solve the following differential equations

(i)

C.F. $y_c = (c_1 + c_2x)e^{2x}$ 1 mark

P.I. $y_p = -\frac{e^{2x}}{4}sin2x$ 2 marks

Answer:

$y = y_c + y_p$

$y = (c_1 + c_2x)e^{2x} - \frac{e^{2x}}{4}sin2x$ 1 mark

(ii)

C.F. $y_c = (c_1x^4 + c_2\frac{1}{x})$ 1 mark

P.I. $y_p = -\frac{x^2}{6}$ 2 marks

Answer:

$y = y_c + y_p$

$y = c_1x^4 + c_2\frac{1}{x} - \frac{x^2}{6}$- 1 mark

b)

Formation of differential equation

$\frac{d^2Q}{dt^2} + 12\frac{dQ}{dt} + 100Q = 48sin10t$ 2 marks

Solution of above diff. eq.

$Q = e^{-6t}(Acos8t + Bsin8t) - \frac{2}{5}cos10t$ 4 marks

I= $\frac{dQ}{dt}$ and put boundary conditions at t=0

$A = \frac{2}{5}, B = \frac{3}{10}$ 1 mark

Put values of A and B in Q and I 1 marks

Q2) a)

$F_c(\tau) = \frac{1}{1+\tau^2}$ Formulae 1 mark answer 2 marks

$F_s(\tau) = \frac{\tau}{1+\tau^2}$ Formulae 1 mark answer 2 marks

In Fourier cosine integral representation put x= m, we get $\int_0^\infty \frac{cosm\tau}{1+\tau^2}d\tau = \frac{\pi}{2}e^{-m}$ 2 marks

b) $f(k+2)+3f(k+1)+2f(k)=0$, $k \geq 0$, f(0)=0, f(1)=1

Z(f(k)=F(z) then Z(f(k+1))=zF(z)-zf(0) as f(0)=0 ,

Z(f(k+1))= zF(z) 1 mark

Z(f(k+2))=$z^2F(z)-z^2f(0)-zf(1)$ and f(0)=0 and f(1)=1

Z(f(k+2))=$z^2F(z)-z$ 1 marks

Express F(z) in terms of z as $F(z)=\frac{z}{(z+1)(z+2)}$ |z|>2 3 marks

Partial fraction of F(z) 1 mark

Inverse Z transform of F(z)

f(k)=$(-1)^k-(-2)^k$, $k \geq 0$ 2+1 marks

Q3) a) correct formulae and values of k_1, k_2, k_3, k_4 3 marks

$k=\frac{1}{6}[k_1+2k_2+2k_3+k_4]$

And last correct answer $y_1= y_0$+k 1 mark

b) Table of values of x and y 1 mark

Correct formulae of Simpsons $\frac{1}{3}rd$ Rule 1 mark

Correct answer of Integral 1 mark