B.Tech. (CE/ECE) (Sem. - 3rd)
ENGINEERING MATHEMATICS - III
SUBJECT CODE : BTAM - 301 (2011 & 2012 Batch)
Paper ID : [A1128]

Time : 03 Hours   Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **Compulsory** consisting of Ten questions carrying Two marks each.

2) Section - B contains Five questions carrying Five marks each and students has to attempt any **Four** questions.

3) Section - C contains Three questions carrying Ten marks each and students has to attempt any **Two** questions.

Section - A

Q1)

a) Define saw tooth waveform and find its Fourier series.

b) State the conditions required to be satisfied for a function to be expressed in terms of Fourier series.

c) Find Laplace transform of $f(t) = |t - 1| + |t + 1|, t \geq 0|$.

d) Find Inverse transform of $\left(\dfrac{e^{-2s}}{(s + 1)(s + 2)} \right)$.

e) Form the Partial Differential Equation corresponding to $z = f\left(\dfrac{xy}{z} \right)$.

f) Solve the partial differential equation $z(p - q) = z^2 + (x + y)^2$, where $p = \dfrac{\partial z}{\partial x}, q = \dfrac{\partial z}{\partial y}$.

g) Find the solution of $x\dfrac{d^2 y}{dx^2} - \dfrac{dy}{dx} + 4x^2 y = 0$ in terms of Bessel's function.

h) State Rodrigue formula and employing it show that $x = P_1(x)$.

i) Find the poles and residue at each pole of $\dfrac{1 - e^{2z}}{z^4}$.

j) Find the analytic function whose imaginary part is $e^x \cos y$.

Section - B

Q2) Find Fourier series of the function $x \cos x$ in $-\pi \le x \le \pi$.

Q3) Solve the differential equation by using Laplace transform

$$\frac{d^2 y}{dt^2} + 2\frac{dy}{dt} - 2y = 3\cos 3t - 11\sin 3t, \text{ given that } y(0) = 0, y'(0) = 0.$$

Q4) Solve the partial differential equation $\dfrac{\partial^2 z}{\partial y^2} + 2\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial^2 z}{\partial y^2} = \sin(x - y)$.

Q5) Prove that $J_{-1/2}(x)] = \sqrt{\dfrac{2}{\pi x}} \cos x$.

Q6) Prove that $w = \dfrac{2z + 3}{z - 4}$ maps the circle $x^2 + y^2 - 4x = 0$ on to the line $4u + 3 = 0$.

Section - C

Q7) a) Evaluate $\displaystyle\int_0^\infty \frac{\sin t}{t}\, dt$ using Laplace transform.

b) Find series solution of the function $(1 - x^2)\dfrac{d^2 y}{dx^2} - 2x\dfrac{dy}{dx} + 2y = 0$.

Q8) Evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{a + b\sin\theta}, |a| > |b|$ by using contour integration.

Q9) A tightly stretched string with fixed end points x= 0 and x = l is initially in a position given by $y = y_0 \sin^3\left(\dfrac{\pi x}{l}\right)$. If it is released from rest from this position find the displacement y(x, t).

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