Faculty of Engineering (Shoubra) Engineering Mathematics and Physics Department 12th exam



Benha University Mechanical Department 2nd year Production Time allowed: 1 hour

Answer 4 only of the following questions

1- Evaluate the following integrals

$$\int_{0}^{2} \frac{t^{2} d t}{\sqrt{2 - t}} \int_{0}^{\infty} \frac{t^{2} d t}{1 + t^{4}} \int_{0}^{\infty} t^{n} e^{-m t} d t \int_{0}^{1} t^{q/p-1} (1 - t^{q})^{-1/p} d t$$
2- Find F(s) of the following functions:
a) $f(t) = \begin{cases} 2 & 0 < t \le 2 \\ 3t & 2 < t \le 3 \\ t^{2} & t > 3 \end{cases}$ b) $g(t) = \sin^{2} 4t + \cos 2t \cosh 5t + \frac{e^{2t} - e^{-3t}}{t}$
3- Find inverse Laplace of the following functions
a) $F(s) = \frac{s}{s^{2} + 4s + 9}$, b) $F(s) = \frac{e^{-2s}}{s + 3}$, c) $F(s) = \frac{1}{(s + 9)^{3}}$,
4- Solve the following differential equation using Laplace:
 $y^{n} - 3y^{n} + 2y = 8e^{2t}$, $y(0) = y^{n}(0) = 3$
5- $f(x) = \cos x$, $-\pi < x < \pi$, then deduce the sum
 $\frac{1}{1^{2} \cdot 3^{2}} + \frac{1}{3^{2} \cdot 5^{2}} + \frac{1}{5^{2} \cdot 7^{2}} + \dots$
6- $y^{n} = \frac{y + 1}{x}$, $y = 3$ at $x = 2$, find y (2.8), $h = 0.2$
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