

**Benha University Mechanical Department** 2<sup>nd</sup> year Production Time allowed: 1 hour

## Answer 4 only of the following questions

1- Evaluate the following integrals

$$\int_{0}^{2} \frac{t^2 dt}{\sqrt{2-t}}$$

$$\int_{0}^{\infty} \frac{t^2 dt}{1 + t^4}$$

$$\int_{0}^{2} \frac{t^{2}dt}{\sqrt{2-t}} \qquad \int_{0}^{\infty} \frac{t^{2}dt}{1+t^{4}} \qquad \int_{0}^{\infty} t^{n} e^{-mt} dt$$

$$\int_{0}^{1} t^{q/p-1} (1-t^{q})^{-1/p} dt$$

2- Find F(s) of the following functions:

a) 
$$f(t) = \begin{cases} 2 & 0 < t \le 2 \\ 3t & 2 < t \le 3 \\ t^2 & t > 3 \end{cases}$$

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 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:

$$y^3 = 3y^2 + 2y = 8e^{2t}, y(0) = y(0) = 3$$

 $y\text{``-}3y\text{`}+2y=8e^{2t},\ y(0)=y\text{`}(0)=3$  5- f(x) = |cosx|, -\pi < x < \pi, then deduce the sum

$$\frac{1}{1^{2}.3^{2}} + \frac{1}{3^{2}.5^{2}} + \frac{1}{5^{2}.7^{2}} + \dots$$

6- 
$$y' = \frac{y+1}{x}$$
,  $y = 3$  at  $x = 2$ , find  $y(2.8)$ ,  $h = 0.2$ 

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