

الإسم ..... الرقم .....

أجب عن جميع الأسئلة  
\*ورقة الإمتحان تشتمل على 5 صفحات\*

**question ( 1 ) :**

Using Gamma and Beta functions, evaluate the following integrals

1.  $\int_0^{\infty} x^{10} e^{-x} dx$

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2.  $\int_0^{\frac{\pi}{2}} \sin^5 x \cos^3 x dx$

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3.  $\int_{-\infty}^0 e^{2x} (1 - e^x)^{\frac{1}{2}} dx$

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4. Find  $B(3, \frac{3}{2})$

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Prove that

5.  $B(m, n) = B(n, m)$

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**question ( 2 ) :**

Prove that

$$L(e^{at}f(t)) = f(s - a)$$

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1. Prove that by **using Derivative**

$$L(\sin at) = \frac{a}{s^2+a^2}$$

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2. Find

$$L(\sinh 7t + \cos 4t)$$

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$$L(e^{-4t} + 7)$$

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$$L(\cosh \frac{t}{3} + \cos\sqrt{2}t)$$

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$$L(e^{-3t} \sin 5t)$$

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$$L(\sqrt{\frac{e^{2t}}{t}})$$

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**question ( 3 ) :**

1. Find

$$L^{-1}\left(\frac{1}{s-9} + \frac{6}{s^4} - \frac{1}{(s+2)^3}\right)$$

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$$L^{-1}\left(\frac{4}{s^2+6s+1}\right)$$

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$$L^{-1}\left(\frac{s-1}{s^3-3s^2+2s}\right)$$

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2. Prove that

$$L(F'(t)) = s F(s) - F(0)$$

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3. Solve the differential equation by using Laplace transform

$$f''(t) - 3f'(t) + 2f(t) = e^t$$
$$f(0) = 0 \quad , \quad f'(0) = -3$$

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