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**SUBJECT CODE NO:- B-2030**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2019**  
**Mathematics MAT - 302**  
**Integral Transforms**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- i) All questions are compulsory.
- ii) Figures to the right indicate full marks.

Q.1 (A) Attempt any one: 08

- a) Prove that,  $\beta(l, m) = \frac{\Gamma(l)\Gamma(m)}{\Gamma(l+m)}$ , where  $ml$  are positive integer.
- b) Prove that,  $2^n \Gamma\left(n + \frac{1}{2}\right) = 1.3.5 \dots (2n - 1) \cdot \sqrt{\pi}$ , where  $n$  is positive integer.

(B) Attempt any one: 07

- c) Evaluate  $\int_0^1 \frac{x^{m-1}(1-x)^{n-1}}{(a+x)^{m+n}} dx$
- d) Find  $L\{e^{-t}(3\sinh 2t - 5\cosh 2t)\}$

Q.2 (A) Attempt any one: 08

- a) Derive relationship between Fourier transform and Laplace transform.
- b) Prove that,  $L^{-1}\left\{\frac{1}{(s^2+a^2)^2}\right\} = \frac{1}{2a^3}\{\sin at - at \cos at\}$

(B) Attempt any one: 07

- c) Solve by using Laplace transform  
 $(D^2 + 25)y = 6 \cos(3t)$ , with  $y(0) = 2, y'(0) = 0$
- d) Find  $L^{-1}\left\{\tan^{-1} \frac{8}{s^2}\right\}$

Q.3 (A) Attempt any one: 05

- a) If  $L\{F(t)\} = f(s)$ , then prove that  
 $L\{t^n F(t)\} = (-1)^n \frac{d^n f(s)}{ds^n}$
- b) If  $F\{F(x)\} = f(s)$ , then prove that  
 $F\{F(x - a)\} = e^{-isa} f(s)$ .

(B) Attempt any one: 05

- c) Find the Fourier transform of  $f(x) = \frac{1}{x}$ .
- d) Find  $L^{-1}\left\{\frac{s^2}{(s^2-4)^2}\right\}$

Q.4 For each of the following questions four alternatives are given for the answer. Only one of them is correct. Choose the correct alternative. 10

- 1) The value of  $\Gamma(1) \Gamma(2) \Gamma(3) \dots \Gamma(9)$  is.....
- a)  $\frac{2\pi}{\sqrt{10}}$

- b)  $\frac{(2\pi)^9}{\sqrt{10}}$
- c)  $\frac{(2\pi)^2}{\sqrt{10}}$
- d)  $\frac{\pi^2}{\sqrt{10}}$
- 2) The value of  $\Gamma\left(\frac{1}{2}\right)$  is .....
- a) 0
- b)  $\pi$
- c)  $\sqrt{\pi}$
- d)  $\pi^2$
- 3) The value of  $L\{\cosh(at)\}$  is .....
- a)  $\frac{a}{s^2-a^2}$
- b)  $\frac{s}{s^2-a^2}$
- c)  $\frac{s}{s^2+a^2}$
- d)  $\frac{a}{s^2+a^2}$
- 4) The value of  $F\{e^{ax}\}$  is .....
- a)  $\frac{s}{s^2+a^2}$
- b)  $\frac{a}{s^2+a^2}$
- c)  $\frac{s}{s^2-a^2}$
- d) None of these
- 5) The value of  $L\{t^3\}$  is .....
- a)  $\frac{6}{s^4}$
- b)  $\frac{1}{s^4}$
- c)  $s^4$
- d)  $\frac{s^4}{6}$