



**Avinashilingam Institute for Home Science and Higher Education for Women**  
 (Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)  
 Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B  
 Coimbatore - 641 043, Tamil Nadu, India

**Bachelor's Degree Examination – June / July 2021**  
**II Semester**

**Class : I UG**  
**Major : Mathematics**

**Time : 3 Hours**  
**Max. Marks : 100**

**18BMAC05 Trigonometry and Laplace Transforms**

**Part A**  
**Choose the Correct Answer**

**10 x 1 = 10**

1.  $\cos\theta = \dots\dots\dots$  CO1 K1
  - a.  $1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} \dots\dots\dots$
  - b.  $1 + \frac{\theta^2}{2!} + \frac{\theta^4}{4!} \dots\dots\dots$
  - c.  $1 - \frac{\theta^2}{2!} - \frac{\theta^4}{4!} \dots\dots\dots$
  - d.  $1 + \frac{\theta^2}{2!} - \frac{\theta^4}{4!} \dots\dots\dots$
  
2. The power of sine series will be in a series of  $\dots\dots\dots$  as the power is odd or even. CO1 K1
  - a. sines
  - b. sines or cosines
  - c. cosines
  - d. sines and cosines
  
3.  $\cosh(iz) =$  CO2 K1
  - a.  $\cosh z$
  - b.  $\sinh z$
  - c.  $\cos z$
  - d.  $\sin z$
  
4.  $\cosh^2 z - \sinh^2 z =$  CO2 K1
  - a. 0
  - b. -1
  - c.  $\infty$
  - d. 1
  
5.  $\sin(ix) =$  CO2 K1
  - a.  $\sin x$
  - b.  $\cos x$
  - c.  $\cosh x$
  - d.  $i \sinh x$
  
6.  $\log(-1) =$  CO3 K1
  - a. i
  - b. -i
  - c.  $i\pi$
  - d.  $-i\pi$
  
7.  $L(\sin at) =$  CO3 K1
  - a.  $\frac{a}{(s^2)}$
  - b.  $\frac{a}{(s^2 - a^2)}$
  - c.  $\frac{a}{(s^2 + a^2)}$
  - d.  $\frac{a}{(s^2 * a^2)}$
  
8.  $L(\cos bt) =$  CO3 K1
  - a.  $\frac{s}{(s^2 + b^2)}$
  - b.  $\frac{s}{(s^2 - b^2)}$
  - c.  $\frac{a}{(s^2 + b^2)}$
  - d.  $\frac{a}{(s^2 - b^2)}$
  
9.  $L^{-1}\left(\frac{n!}{s^{n+1}}\right) =$  CO5 K1
  - a.  $t^n$
  - b.  $t^{-n}$
  - c. 1
  - d. 0
  
10.  $L^{-1}\left(\frac{1}{s-a}\right) =$  CO5 K1
  - a.  $e^{-at}$
  - b.  $e^{at}$
  - c. st
  - d. -st

**Part B**  
**Answer ALL questions**

**5 x 6 = 30**

**Each answer should not exceed 400 words or two pages**

- 11.a. Using De Moivre's theorem, expand  $\cos^8 \theta$  in a series of cosines of multiples of  $\theta$ . CO1 K2
- (or)
- 11.b. Evaluate  $\lim_{x \rightarrow 0} \left( \frac{5 \sin x - \sin 5x}{5(\cos x - \cos 5x)} \right)$ . CO1 K2
- 12.a. Evaluate  $\lim_{n \rightarrow \infty} \left( \cos \frac{x}{n} \right)^{n^2}$ . CO2 K3
- (or)
- 12.b. Separate into real and imaginary parts of  $\coth(\alpha + i\beta)$ . CO2 K3
- 13.a. Prove that  $\cosh^{-1} y = \log(y + \sqrt{y^2 - 1})$ . CO3 K4
- (or)
- 13.b. Find the general and principal logarithmic values of  $(1-i)$  and  $(1+i)$ . CO3 K4
- 14.a. Find  $L(\sin^3 2t)$ . CO4 K5
- (or)
- 14.b. Find  $L(t \sin at)$ . CO4 K5
- 15.a. Find  $L^{-1} \left( \frac{1}{s(s+a)} \right)$ . CO3 K5
- (or)
- 15.b. Find  $L^{-1} \left( \frac{s}{(s-b)} \right)$ . CO3 K5

**Part C**

**5 x 12 = 60**

**Answer ALL questions**

**Each answer should not exceed 800 words or four pages**

- 16.a. Express  $\cos 6\theta$  and  $\frac{\sin 6\theta}{\sin \theta}$  in series of powers of  $\cos \theta$ . CO1 K4
- (or)
- 16.b. Expand  $\cos 7\theta$  in powers of  $\cos \theta$  and  $\sin 7\theta$  in powers of  $\sin \theta$ . Also find  $\tan 7\theta$  in powers of  $\tan \theta$ . CO1 K4
- 17.a. i. If  $\frac{\sin \theta}{\theta} = \frac{5045}{5046}$ , prove that angle  $\theta$  is  $1^\circ 58'$ . CO2 K4
- ii. Solve approximately  $\cos \left( \frac{\pi}{3} + \theta \right) = 0.49$ .
- (or)
- 17.b. i. Evaluate  $\lim_{\theta \rightarrow 0} \left( \frac{n \sin \theta - \sin n\theta}{\theta(\cos \theta - \cos n\theta)} \right)$ . CO2 K4
- ii. Evaluate  $\lim_{\theta \rightarrow 0} \left( \frac{x \log(1+x)}{(1-\cos x)} \right)$ .
- 18.a. If  $x+iy = \tan(A+iB)$ , prove that  $x^2 + y^2 + 2x \cot A = 1$  and  $x^2 + y^2 - 2y \coth 2B + 1 = 0$ . CO5 K5
- (or)
- 18.b. If  $\cos(x+iy) = r(\cos \alpha + i \sin \alpha)$ , prove that  $\cos 2x + \cosh 2y = 2r^2$  and  $y = \frac{1}{2} \log \frac{\sin^2(x-\alpha)}{\sin^2(x+\alpha)}$ . CO5 K5

CO4 K5

19.a. Find  $L(t^2 \cos at)$  and  $L(te^{-t} \sin t)$ .  
(or)

19.b. Find  $L^{-1}\left(\frac{1}{(s^2+a^2)^2}\right)$  and  $L^{-1}\left(\frac{s-3}{(s^2+4s+13)}\right)$ .

CO4 K5

20.a. Solve  $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 13y = 2e^{-x}$  given that  $y=0, \frac{dy}{dx} = -1$  when  $x = 0$ .  
(or)

CO3 K6

20.b. Solve the simultaneous equations  $\frac{dx}{dt} - \frac{dy}{dt} - 2x + 2y = 1 - 2t$ ,  
 $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + x = 0$ .

with the conditions  $x=0, y=0, \frac{dx}{dt} = 0$  when  $t = 0$ .

CO3 K6

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