

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2026

Course: Common to all branches

Semester: II

Subject Code & Name: (BTBS201) Engineering Mathematics - II

Max Marks: 60

Date: 08.07.2026

Duration: 3 Hr.

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No. 6.
4. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
5. Use of non-programmable scientific calculators is allowed.
6. Assume suitable data wherever necessary and mention it clearly.

		(CO)	Marks
Q. 1	Objective type questions. (Compulsory Question)		12
1	The argument of complex number $z = i^2$ is equal to	CO 1	1
	a. $\theta = 2\pi$ b. $\theta = \pi$ c. $\theta = 3\pi$ d. None		
2	The real part of $\sin(x + iy)$ is equal to	CO 1	1
	a. $\sin x \cosh y$ b. $\cos x \sinh y$ c. $-\sin x \sinh y$ d. None		
3	If ω is a complex cube root of unity, then $\left(\frac{1+\omega}{\omega^2}\right)^3$ is equal to	CO 1	1
	a. 1 b. -1 c. 0 d. None		
4	The differential equation of the form $\frac{dy}{dx} + Py = Q$ where P and Q are the functions of x is	CO 2	1
	a. variable separable form b. exact differential equation c. homogeneous diff. equation d. None		
5	The integrating factor of the Linear differential equation $\frac{dr}{d\theta} + (2 \cot \theta)r = -\sin 2\theta$	CO 2	1
	a. $\sin^2 \theta$ b. $\cos^2 \theta$ c. $\tan^2 \theta$ d. None		
6	The complementary function of $(25D^2 - 20D + 4)y = 0$ is	CO 3	1
	a. $(c_1 + c_2x)e^{\frac{1}{5}x}$ b. $(c_1 + c_2x)e^{\frac{5}{2}x}$ c. $(c_1 + c_2x)e^{\frac{2}{5}x}$ d. None		
7	The complementary function of $(D^2 - 2D)y = 0$ is	CO 3	1
	a. $(c_1 + c_2x)e^{3x}$ b. $(c_1 + c_2x)e^{2x}$ c. $(c_1 + c_2x)e^x$ d. None		
8	The Particular Integral of $(D^3 - 3D^2 + 4)y = e^{2x}$ is	CO 3	1
	a. $\frac{x^2}{6}e^{2x}$ b. $\frac{x^3}{6}e^{2x}$ c. $\frac{x^2}{6}e^{3x}$ d. None		
9	The value of b_n in the Fourier series expansion of $f(x) = \frac{\pi-x}{2}$ in the interval $(0, 2\pi)$ is	CO 4	1
	a. 2π b. π c. 3π d. None		
10	The value of a_0 in the Fourier series expansion of $f(x) = x^2$, in the interval $(0,4)$ is	CO 4	1
	a. 1 b. 0 c. 2 d. None		

11	If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, then $\nabla \times \vec{r}$ is			CO 5	1
	a. $\vec{3}$	b. $\vec{1}$	c. $\vec{2}$		
12	The vector field along $\vec{F}$ is said to be irrotational if			CO 5	1
	a. $\nabla \times \vec{F} = 0$	b. $\nabla \times \vec{F} \neq 0$	c. $\nabla \cdot \vec{F} = 0$		
Q. 2	Solve the following.				12
A)	If $\alpha = 1 + i, \beta = 1 - i$ and $\cot \theta = 1 + x$, prove that $(x + \alpha)^n + (x + \beta)^n = 2 \cos n\theta \operatorname{cosec}^n \theta$			CO 1	6
B)	If $p \log(a + ib) = (x + iy) \log m$, prove that $\frac{y}{x} = \frac{2 \tan^{-1} \frac{b}{a}}{\log(a^2 + b^2)}$.			CO 1	6
Q.3	Solve the following.				12
A)	Solve $\cos^2 x \frac{dy}{dx} + y = \tan x$			CO 2	6
B)	Solve $(x^2 + y^2)dx - (xy) dy = 0$.			CO 2	6
Q. 4	Solve any TWO of the following.				12
A)	Solve $(D^2 + 5D + 4)y = x^2 + 7x + 9$.			CO 3	6
B)	$(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$.			CO 3	6
C)	Solve by the method of variation of parameters: $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$.			CO 3	6
Q.5	Solve any TWO of the following.				12
A)	Obtain the Fourier series for $f(x) = e^{-x}$ in the range $(0, 2\pi)$.			CO 4	6
B)	Find Fourier series for $f(x) = 1 - x^2, -1 \leq x \leq 1$.			CO 4	6
C)	Find half range Fourier sine series for $f(x) = x$, in the range $(0, \pi)$.			CO 4	6
Q. 6	Solve any TWO of the following.				12
A)	If $\vec{r}$ is the position vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ with $ \vec{r} = r$, then evaluate (a). ∇r^m (b). ∇r (c). $\nabla \frac{1}{r}$			CO 5	6
B)	If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$, prove that $\vec{F} \cdot \operatorname{Curl} \vec{F} = 0$.			CO 5	6
C)	Verify Stokes' theorem for $\vec{F} = xy^2\hat{i} + y\hat{j} + z^2x\hat{k}$ for the surface of the rectangle bounded by $x = 0, y = 0, x = 1, y = 2, z = 0$.			CO 5	6
	*** End ***				