

QP Code

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Register Number

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VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Semester Examinations – Apr / May 2017

Regulations-2016

Programme: B.E./B.Tech.

Semester: 2

Max. Marks: 100

Duration 3 Hrs

Course Code & Title: **16MAT21**

MATHEMATICS-II

Knowledge
Levels (KL)

K1 - Remembering
K2 - Understanding

K3 - Applying
K4 - Analysing

K5 - Evaluating
K6 - Creating

Part A - Answer ALL Questions.

10 x 2 = 20 Marks

No.	Question	KL
1.	If $\phi = x^2 + y - z - 1$, find grad ϕ at $(1, 0, 0)$.	K2
2.	Evaluate $\text{div} \vec{F}$ at the point $(1, 2, 3)$ given $\vec{F} = x^2 y z \vec{i} + x y^2 z \vec{j} + x y z^2 \vec{k}$.	K2
3.	Eliminate 'y' from the system $\frac{dx}{dt} + 2y = -\sin t$, $\frac{dy}{dt} - 2x = \cos t$.	K5
4.	Find the Wronskian Co-efficient of $y'' - 2y' + y = e^x \log x$.	K2
5.	State initial value theorem on Laplace theorem.	K1
6.	Define periodic function.	K1
7.	Write necessary conditions for a complex function $f(z)$ to be analytic.	K1
8.	Show that the function $f(z) = \bar{z}$ is nowhere differentiable.	K3
9.	Compute the residue of $f(z) = \frac{z+2}{(z-2)(z+1)^2}$ at its simple pole $z = 2$.	K2
10.	Define removable singularity with an example.	K1

Part B - Answer ALL Questions.

5 x 16 = 80 Marks

No	Question	Marks	KL
11.	<p>a i. Show that $\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential function.</p> <p>ii. Show that $\nabla^2(r^n) = n(n+1)r^{n-2}$.</p> <p style="text-align: center;">OR</p> <p>b Verify Green's theorem in the XY plane for $\int_C [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$ where C is the boundary of the region given by $x = y^2$ and $y = x^2$.</p>	8	K2
		8	K3
		16	K3
12.	<p>a i. Solve $(x^2 D^2 + 4xD + 2)y = \log x$.</p> <p>ii. Solve $(D^2 + 2D + 5)y = x^2 e^{-x}$.</p>	8	K5
		8	K5

OR

- b i. Solve $\frac{dx}{dt} + 2y = \sin 2t; \frac{dy}{dt} - 2x = \cos 2t$. 8 K5
- ii. Using the method of variation of parameters, solve $(D^2 + 4)y = \tan 2x$. 8 K5
13. a i. Find the Laplace transform of the periodic function 8 K4
- $$f(t) = \begin{cases} t & 0 < t < a \\ 2a - t & a < t < 2a \end{cases} \quad \text{where } f(t+2a) = f(t)$$

- ii. Using Convolution theorem, find 8 K4
- $$L^{-1} \left[\frac{1}{s(s^2 + a^2)} \right]$$

OR

- b Solve: $y'' - 3y' - 4y = 2e^{-t}$, given $y(0) = 1$ and $y'(0) = 1$, by using Laplace transform method. 16 K4
14. a i. Find the analytic function $f(z)$ whose imaginary part is $e^{-x}[x \cos y + y \sin y]$. 8 K3
- ii. Show that an analytic function with constant real part is constant and an analytic function with constant modulus is also constant 8 K4

OR

- b i. Find the bilinear transformation that maps their points $1, i, -1$ into the points $0, 1, \infty$. 8 K3
- ii. Find the image of the infinite strip $1 < x < 2$ under the transformation $\omega = \frac{1}{z}$. 8 K4

15. a i. Using Cauchy's Integral formula, evaluate $\int_C \frac{dz}{(z-2)(z+1)^2}$ where C is $|z| = \frac{3}{2}$. 8 K3
- ii. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent's series valid for $1 < |z| < 3$. 8 K3

OR

- b Evaluate $\int_0^{2\pi} \frac{d\theta}{13 + 5 \sin \theta}$, using contour integration. 16 K3
