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Register Number: ……………………..

B.E/B.TECH DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Second Semester

MAT102: ENGINEERING MATHEMATICS - II

(Common to CE / AE / AUTO / ME / MCE / EEE / ECE / EIE)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART - A (10 x 1 = 10 Marks)

1. The limits of the double integral $\iint_R f(x,y)\,dxdy$ *is* _____ ,where R is in the first quadrant and bounded by x = 0, y = 0, x = y and y = 1.

a) $\int_0^1 \int_0^y f(x,y)\,dxdy$ b) $\int_x^y \int_0^1 f(x,y)\,dxdy$

c) $\int_0^1 \int_1^y f(x,y)\,dydx$ d) $\int_1^x \int_0^1 f(x,y)\,dydx$

2. The value of $\int_1^a \int_1^b \frac{1}{x\,y}\,dxdy$ is _______.

a) $\log\, a\, b$ b) $\log\, a\ \log b$

c) $\log \frac{a}{b}$ d) $\log\, a + \log b$

3. If φ is a scalar point function then Curl (grad φ) = ______ .

a) 1 b) 0

c) φ d) 3

4. The value of $\int_C \vec{r} \,.\, \overrightarrow{dr}$ = _______.

a) 1 b) 0

c) r d) $x^2 + y^2 + z^2$

5. The function f(z) = $z - 5\,\bar{z}$ is ______ function .

a) analytic b) entire

c) not analytic d) periodic

6. The transformation f(z) = $\frac{a\,z+b}{c\,z+d}$ is Conformal only when _______ .

a) $f(z) = 0$ b) $f'(z) \neq 0$

c)	$f'(z) = 0$	d)	$f(z) \neq 0$

7. If f(z) is analytic at all points inside and on a simple closed curve C then $\int_C f(z)dz =$ ______ .

a)	1	b)	$2\pi i\, f(a)$
c)	0	d)	$2\pi i\,(R_1 + R_2 + \cdots + R_n)$

8. The value of $\int_C \frac{dz}{(z-3)^2}$ is ______ , where C is circle |z| = 1 .

a)	1	b)	0
c)	2	d)	3

9. Which one of the following function does not exist Laplace transforms?

a)	sin t	b)	cos t
c)	tan t	d)	cos h t

10. If L{ f (t) } = φ (s) then L{ f (a t) } = _______ .

a)	a φ (s a)	b)	$\varphi\left(\frac{s}{a}\right)$
c)	$\frac{1}{a}\varphi(s\,a)$	d)	$\frac{1}{a}\varphi\left(\frac{s}{a}\right)$

PART - B (10 x 2 = 20 Marks)

11. Sketch roughly the region of integration for $\int_0^1 \int_0^x f(x,y)\ dxdy$.

12. Evaluate: $\int_0^1 \int_0^2 \int_0^3 x\,y\,z\ \ dx\,dy\,dz$.

13. What is the value of 'a' if $\vec{F} = (2x-5y)\vec{\imath} + (x+ay)\vec{\jmath} + (3x-z)\vec{k}$ is Solenoidalvecto?

14. Find the Unit normal vector to the surface $x^3 - xyz + z^3 = 1$ at the point (1,1,1).

15. Verify whether the function $y + e^x cosy$ is harmonic or not .

16. Find the Fixed points of the transformation $w = \frac{3z-4}{z-1}$.

17. What is the nature of the function f(z)= $\frac{sin\,z - z}{z^3}$ at z = 0 .

18. State Cauchy's Residue theorem.

19. Find L { $cos^2 3t$}.

20. Obtain f (t) if L{ f(t)} is $\frac{S}{(S-2)^5}$.

PART - C (5 x 14 = 70 Marks)

21. a) (i) Change the order of integration in $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} dx\,dy$ and hence evaluate it . (7)

(ii) Evaluate :$\int_0^1 \int_0^{1-x} \int_0^{(x+y)^2} x\ \ dz\,dy\,dx$. (7)

(OR)

b) (i) Find the area of the ellipse : $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. (7)

(ii) Transform the integral $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2 + y^2}\, dy\, dx$ into Polar co-ordinates and hence evaluate it . (7)

22. a) Verify Green's theorem in a plane for $\int_C [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$, where C is the boundary of the region defined by the lines x = 0, y = 0 and x + y = 1 .

(OR)

b) Verify Stoke's theorem for $\vec{F} = y^2 z\, \vec{i} + z^2 x\, \vec{j} + x^2 y\, \vec{k}$, where S is the open surface of the cube formed by the planes $x = \pm a$, $y = \pm a$ and $z = \pm a$ in which the plane z = – a is cut .

23. a) (i) If f(z) is a regular function in a domain D then Prove that $\nabla^2 |f(z)|^2 = 4\, |f'(z)|^2$. (7)

(ii) Determine the analytic function $f(z) = u + iv$ given that $3u + 2v = y^2 - x^2 + 16\, xy$. (7)

(OR)

b) (i) Determine the image of 1< x < 2 under the mapping w = 1/z . (7)

(ii) Find the bilinear transformation which maps the points – 1 , 0 , 1 in Z-plane into the points 0 , i , 3i in W-plane . (7)

24. a) (i) Evaluate : $\int_C \frac{z+4}{z^2 + 2z + 5}\, dz$, $where$ C is $|z + 1 + i| = 2$. (7)

(ii) Evaluate : $\int_{-\infty}^{\infty} \frac{x^2}{(x^2 + a^2)(x^2 + b^2)}\, dx$, by using Contour integration , where a > b > 0 . (7)

(OR)

b) (i) Show that : $\int_0^{2\pi} \frac{d\theta}{13 + 5 \sin\theta} = \frac{\pi}{6}$, by using Contour integration . (7)

(ii) Find the Laurent's Series expansion of $f(z) = \frac{z}{(z^2+1)(z^2+4)}$, valid in the region 1< |z| < 2 . (7)

25. a) (i) Find $L^{-1}\left\{\frac{e^{-3s}}{s^2 + 4s + 13}\right\}$. (7)

(ii) Evaluate : $\int_0^{\infty} t\, e^{-2t} \sin 3t\, dt$. (7)

(OR)

b) (i) Find the Laplace transform of the full sine wave rectifier function f(t) defined as $f(t) = |\sin \omega\, t|$, $t > 0$ $given\ that\ f\left(t + \frac{\pi}{\omega}\right) = f(t)$. (7)

(ii) Solve :$(D^2 + D - 2)\, y = 3\cos 3t - 11\sin 3t$, by using L . T . Given that y(0) = 0 and y'(0) = 6 . (7)

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