Register Number:……..

KUMARAGURU
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GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K_1 to K_6)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

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

(Regulation 2014)

Second Semester

U14MAT201: ENGINEERING MATHEMATICS - II

Common to all Branches

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

Answer all the Questions

PART A (10 x 1 = 10 Marks)

1. Match list I (Cartesian form) with list II (polar form) and select the correct answer using the codes given below. [K_2]

List I	List II
A. $\int_0^a \int_0^{\sqrt{ax-x^2}} \frac{x}{x^2+y^2}\, dxdy$	i. $\int_0^{\pi/4} \int_0^{a\sec\theta} \cos\theta dr d\theta$
B. $\int_0^a \int_y^a \frac{xdxdy}{x^2+y^2}$	ii. $\int_0^{\pi/2} \int_0^a r\sqrt{a^2-r^2}\, dr d\theta$
C. $\int_0^a \int_{\sqrt{ax-x^2}}^{\sqrt{a^2-x^2}} \sqrt{a^2-x^2-y^2}\, dxdy$	iii. $\int_0^{\pi/2} \int_0^{a\cos\theta} \cos\theta dr d\theta$

D. $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{a^2-x^2-y^2}\,dxdy$	iv. $\int_0^{\pi/2} \int_{a\cos\theta}^{a} r\sqrt{a^2-r^2}\,drd\theta$

	A	B	C	D
a)	iv	ii	iii	i
b)	ii	iv	i	iii
c)	i	iii	ii	iv
d)	iii	i	iv	ii

2. The evaluation of the integral $\int_0^1 \int_0^2 \int_0^3 xyz\,dxdydz$ gives [K_3]

a) 5/2 b) 9/2
c) 2/5 d) 2/9

3. Examine the two statements carefully and select the answer using the codes given below: [K_2]
Assertion (A) : If ϕ and ψ are differentiable scalar point functions, then $\nabla\phi\times\nabla\psi$ is solenoidal
Reason (R) : curl (grad ϕ) = 0 for any scalar point function ϕ

a) both A and R are individually true and R is the correct explanation of A
b) both A and R are individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true.

4. If $\phi=xyz$, then grad ϕ at (1,1,1) is [K_3]

a) $\vec{i}-\vec{j}+\vec{k}$ b) $2\vec{i}-2\vec{j}+2\vec{k}$
c) $2\vec{i}+2\vec{j}+2\vec{k}$ d) $\vec{i}+\vec{j}+\vec{k}$

5. Consider the following statements: [K_1]
1. If u(x,y) and v(x,y) are any two harmonic functions, then u(x,y) + iv(x,y) is an analytic function.
2.Milne – Thompson method is used to check whether a given function is analytic or not
3. $f(z)=|z|^2$ is not analytic
4.The transformation w = cz, represents magnification and rotation, if c is a complex constant
Which of the above statements are true?

a) 1,2 b) 3,4
c) 1,3 d) 2,4

6. A point z is called a critical point of the transformation w= f(z) if at that point [K_1]

a) f ' (z) ≠ 0 b) f ' (z) = 0
c) f (z) ≠ 0 d) f (z) = 0

7. The steps involved in evaluating an integral $\int_C f(z)dz$ using Cauchy's residue theorem [K_1]
1) Find the poles of f(z) inside C 2) Find the poles of f(z) 3) Apply Cauchy's residue theorem
4) Find the residues at the poles inside C
Find the correct sequence of steps

a) 1-2-3-4 b) 1-2-4-3
c) 2-1-4-3 d) 2-4-1-3

8. If there is no other singularity in the neighbourhood of 'a' the point z = a is called [K_1]

a) pole b) essential singularity

c) removable singularity d) isolated singularity

9. Consider the following statements: [K_2]

1. If $L\{f(t)\}=F(s)$, then $L\{f(at)\}=aF(as)$ 2. If $L\{f(t)\}=F(s)$, then $L\{e^{at}f(t)\}=F(s-a)$

3. The Laplace transform of $t^{\frac{1}{2}}$ is $\frac{\sqrt{\pi}}{2\,s^{\frac{3}{2}}}$. 4. The Laplace transform of a periodic function f (t)

with period p is given by $L[f(t)]=\frac{1}{1-e^{-ps}}\int_0^p e^{-st}f(t)\,dt$

Which of the above statements are true?

a) 1,2,3 b) 2,3,4

c) 1,3,4 d) 1,2,4

10. $L(t\sin at)$= [K_2]

a) $\frac{2a}{(s^2+a^2)^2}$ b) $\frac{2as}{(s^2+a^2)^2}$

c) $\frac{a}{(s^2+a^2)^2}$ d) $\frac{s}{(s^2+a^2)^2}$

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Evaluate $\int_0^{\pi/2}\int_0^{\sin\theta} r\,d\theta\,dr$ [K_3]

12. Find the area of the circle of radius 'a' using by multiple integral and polar coordinates [K_4]

13. Find the directional derivative of $x^2yz+4xz^2$ at (1, -2, -2) in the direction of $2\vec{i}-\vec{j}-2\vec{k}$ [K_3]

14. State Stoke's theorem. [K_2]

15. State any two properties of an analytic function. [K_1]

16. Obtain the fixed points of $w=\frac{3z-4}{z-1}$ [K_3]

17. State Cauchy's integral formula. [K_2]

18. Determine the residues of $f(z)=\frac{z-3}{(z+1)(z+2)}$ [K_3]

19. State the existence conditions of Laplace transform. [K_2]

20. Obtain the inverse Laplace transform of $\log\left(\frac{s+1}{s-1}\right)$ [K_3]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. (i) By changing the order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$ (7) [K_4]

(ii) Identify the bilinear transformation which maps the points 1, i, -1 onto i, 0, -i (7) [K_4]

22. (i) Determine the area of the cardioid $r = 4(1+\cos\theta)$ by double integration. (7) [K_5]

(ii) b) Find the volume of the tetrahedron bounded by the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ and the coordinate planes. (7) [K_5]

23. (i) a) Show that $\vec{F} = (6xy+z^3)\vec{i}+(3x^2-z)\vec{j}+(3xz^2-y)\vec{k}$ is irrotational and find ϕ such that $\vec{F} = \nabla\phi$. (7) [K_4]

(ii) b) Verify the Green's theorem in a plane with respect to $\int_c [(x^2-y^2)\,dx+2xy\,dy]$ where C is the region bounded by x=0, x=1, y=0 and y=2. (7) [K_4]

24. (i) a) Obtain the analytic function whose imaginary part is $e^x(x\sin y + y\cos y)$. (7) [K_3]

(ii) Find the image of the circle $|z|=2$ under the transformation $w = z+2+2i$ (7) [K_3]

25. (i) Using residue calculus and contour integration evaluate $\int_0^{2\pi} \frac{d\theta}{5+3\cos\theta}$. (7) [$K_4$]

(ii) Expand the function $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ as Laurent series, valid in the region $1<|z+1|<3$ (7) [K_4]

26. (i) Obtain the Laplace transform of the triangular wave function (7) [K_5]

$$f(t) = \begin{cases} t & 0<t<1 \\ 2-t & 1<t<2 \end{cases}$$ where $f(t+2) = f(t)$

(ii) Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ by using convolution theorem (7) [K_5]

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