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Question Paper Code: 41002

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

First Semester

Civil Engineering

14UMA102 - ENGINEERING MATHEMATICS – I

(Common to ALL branches)

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

- If 1 and 2 are the eigen values of 2×2 matrix A. what are the eigen values of A^2 .
(a) 1 & 2 (b) 1 & 4 (c) 2 & 4 (d) 2 & 3
- $\begin{vmatrix} 1 & 2 \\ 0 & 2 \end{vmatrix} =$
(a) 0 (b) 1 (c) 2 (d) 3
- Examine the nature of the series $1 + 2 + 3 + 4 + \dots + n + \dots \infty$
(a) divergent (b) convergent (c) oscillatory (d) linear
- The geometric series $1 + r + r^2 + r^3 + \dots + r^n + \dots$ converges if
(a) $r \leq 1$ (b) $r \geq 1$ (c) $r > 1$ (d) $r < 1$
- What is the radius of curvature at (3, 4) on the curve $x^2 + y^2 = 25$?
(a) 5 (b) -5 (c) 25 (d) -25
- The envelope of the family of straight lines $y = mx + \frac{1}{m}$, m being the parameter is
(a) $y^2 = -4x$ (b) $x^2 = 4y$ (c) $y^2 = 4x$ (d) $x^2 = -4y$

7. Let u and v be functions of x, y and $u = e^v$. Then u and v are
 (a) Functionally dependent (b) Functionally independent
 (c) Functionally linear (d) Functionally non-linear
8. A stationary point of $f(x, y)$ at which $f(x, y)$ has neither a maximum nor a minimum is called
 (a) Extreme point (b) Max-Min point
 (c) Saddle point (d) Nothing can be said
9. $\int_0^1 \int_0^2 \int_0^3 xyz dx dy dz$
 (a) 9 (b) $\frac{9}{4}$ (c) $\frac{9}{2}$ (d) $\frac{1}{9}$
10. By changing the order of integration, we get $\int_0^1 \int_0^y f(x, y) dx dy =$
 (a) $\int_0^1 \int_0^x f(x, y) dy dx$ (b) $\int_0^1 \int_x^1 f(x, y) dy dx$ (c) $\int_0^1 \int_0^1 f(x, y) dx dy$ (d) $\int_0^1 \int_0^0 f(x, y) dy dx$

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Diagonalize the matrix by orthogonal transformation $\begin{bmatrix} 10 & -2 & -5 \\ -2 & 2 & 3 \\ -5 & 3 & 5 \end{bmatrix}$. (8)
12. Show that the sum of the series $\frac{15}{16} + \frac{15}{16} \times \frac{21}{24} + \frac{15}{16} \times \frac{21}{24} \times \frac{27}{32} + \dots \infty = \frac{47}{9}$. (8)
13. Find the radius of curvature at any point of the cycloid $x = a(\theta + \sin\theta)$ and $y = a(1 - \cos\theta)$. (8)
14. Find the Taylor's series of $e^x \log(1 + y)$ in powers of x and y up to third degree terms. (8)
15. Change the order of integration and evaluate $\int_0^1 \int_{x^2}^{2-x} xy dy dx$. (8)