RAMAIAH

Institute of Technology

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(Autonomous Institute, Affiliated to VTU)

(Approved by AICTE, New Delhi & Govt. of Karnataka)

Accredited by NBA & NAAC with ‘A’ Grade

SEMESTER END EXAMINATIONS – APRIL / MAY 2021

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| **Program** | **:** | B.E. : Common to all Programs | **Semester** | **:** | I |
| **Course Name** | **:** | Engineering Mathematics - I | **Max. Marks** | **:** | **100** |
| **Course Code** | **:** | MA11/MAT101 | **Duration** | **:** | **3 Hrs** |

**Instructions to the Candidates:**

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| * Answer one full question from each unit. |

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|  |  | **UNIT - I** |  |  |
| 1. | a) | State Euler’s theorem for three variables. | CO1 | (02)` |
|  | b) | If then prove that | CO1 | (04) |
|  | c) | Find the angle of intersection of the pair of curves: | CO1 | (07) |
|  | d) | If  then find | CO1 | (07) |
|  |  |  |  |  |
| 2. | a) | If and are functionally dependent, then express in terms and vice-versa. | CO1 | (02) |
|  | b) | Find the total derivative ofwhere and . | CO1 | (04) |
|  | c) | Show that the pedal equation of the curve  is | CO1 | (07) |
|  | d) | If then prove that | CO1 | (07) |
|  |  |  |  |  |
|  |  | **UNIT - II** |  |  |
| 3. | a) | Classify the double point at the origin of the curve . | CO2 | (02) |
|  | b) | Find the perimeter of the cardioid , | CO2 | (04) |
|  | c) | Evaluate . | CO2 | (07) |
|  | d) | Trace the curve . | CO2 | (07) |
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| 4. | a) | Write the expression to find volume for a polar curve when rotated about initial line and the line . | CO2 | (02) |
|  | b) | Evaluate . | CO2 | (04) |
|  | c) | Trace the curve , | CO2 | (07) |
|  | d) | Find the surface area of the solid generated by revolving the astroid about -axis. | CO2 | (07) |
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|  |  | **UNIT - III** |  |  |
| 5. | a) | Define directional derivative. | CO3 | (02) |
|  | b) | If then find . | CO3 | (04) |
|  | c) | The position vector of a moving particle at time *t* is find the tangential and normal components of its acceleration at | CO3 | (07) |
|  | d) | Find the values of the constants such that  is conservative. Also find its scalar potential. | CO3 | (07) |
|  |  |  |  |  |
| 6. | a) | Define velocity and acceleration of vector function of a single variable . | CO3 | (02) |
|  | b) | Find , where at (1,0,2). | CO3 | (04) |
|  | c) | Find the directional derivative of in the direction of the vector at the point . | CO3 | (07) |
|  | d) | Prove that . | CO3 | (07) |
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|  |  | **UNIT - IV** |  |  |
| 7. | a) | Write the relationship between cartesian coordinates and spherical polar coordinate system. | CO4 | (02) |
|  | b) | Evaluatewhereis the region bounded by the curves:  and(where ). | CO4 | (04) |
|  | c) | Evaluate  by changing the order of integration. | CO4 | (07) |
|  | d) | Find the volume the sphere . | CO4 | (07) |
|  |  |  |  |  |
| 8. | a) | With the help of a neat diagram mark the region of integration of . | CO4 | (02) |
|  | b) | Evaluate by changing to polar coordinates. | CO4 | (04) |
|  |  |  |  |  |
|  | c) | Find the area bounded by the curves  and by double integration. | CO4 | (07) |
|  | d) | Evaluateusing spherical polar coordinates. | CO4 | (07) |
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|  |  | **UNIT -V** |  |  |
| 9. | a) | State Green’s theorem in a plane. | CO5 | (02) |
|  | b) | If is irrotational, then show that , for any closed curve | CO5 | (04) |
|  | c) | Evaluate where and is the surface bounded by and by using Gauss – divergence theorem. | CO5 | (07) |
|  | d) | If , then evaluate from the point (0, 0, 0) to(1, 1, 1) along the straight lines from (0, 0, 0) to (1, 0, 0), (1, 0, 0) to (1, 1, 0) and(1, 1, 0) to (1, 1, 1). | CO5 | (07) |
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| 10. | a) | Define a simple closed curve with an example. | CO5 | (02) |
|  | b) | Evaluate , where and is the boundary of the upper half of the sphere using Stoke’s theorem. | CO5 | (04) |
|  | c) | State and prove Green’s theorem in a plane. | CO5 | (07) |
|  | d) | If and is the rectangular parallelepiped bounded by then evaluate using Gauss divergence theorem. | CO5 | (07) |
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