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Paper Code - U127-101 (RE-F&FF)

JUNE-2018/RE-EXAM

F. Y. B. TECH. (COMMON) (SEMESTER - II)**COURSE NAME: ENGINEERING MATHEMATICS II****COURSE CODE: ES12171****(2017 PATTERN)**

Time: [2 Hours]

[Max. Marks: 50]

(*) Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4 and Q.5
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Q.1)a) Find the equation of the sphere which touches the plane $2x - y - 2z - 4 = 0$ at the point $(1, 2, -2)$ and passes through the point $(-1, 0, 0)$.

[6]

b) Find the equation of the right circular cone which passes through the point $(1, 1, 1)$, has its axis equally inclined to the three coordinate axes and vertex at point $(1, 0, 1)$.

[6]

c) Find the equation of the right circular cylinder of radius 2 and whose axis lies along the straight line $\frac{x-1}{2} = \frac{y+3}{-1} = \frac{z-2}{5}$.

[4]

OR

Q.2)a) Find the sphere through the circle $x^2 + y^2 + z^2 = 4; z = 0$ meeting the plane $x + 2y + 2z = 0$ in a circle of radius of 3.

[6]

b) Obtain the equation of a right circular cone which passes through the point $(2, 1, 3)$ with vertex at $(1, 1, 2)$ and axis parallel to the

$$\text{line } \frac{x-2}{2} = \frac{y-1}{-4} = \frac{z+2}{3}.$$

[6]

c) Find the equation of the right circular cylinder of radius 5 and whose axis is the straight line $\frac{x-2}{2} = \frac{y-3}{1} = \frac{z+1}{1}$.

[4]

Q.3) a) Evaluate: $\int_0^1 \int_0^{\sqrt{1-y^2}} \frac{\cos^{-1} x dx dy}{\sqrt{(1-x^2-y^2)(1-x^2)}}$ [6]

b) Evaluate: $\iint_R \frac{x^2 y^2}{x^2 + y^2} dx dy$, where R is annulus between $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

[4]

c) Find the volume enclosed between the cylinders $x^2 + y^2 = 2ax$ and $z^2 = 2ax$.

[4]

OR

Q.4)a) Evaluate: $\int_0^{\log 2} \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$ [6]

b) Evaluate: $\iiint_V \frac{z^2}{x^2 + y^2 + z^2} dx dy dz$, where V is the volume bounded

by $x^2 + y^2 + z^2 = 2$.

[4]

c) Find the area between the curve $xy^2 = a^2(a-x)$ and its asymptote. [4]

Q.5) Attempt the following : [2 marks each] [20]

a) Find the differential equation whose general solution is $y = 3 + \sqrt{cx}$, where C is an arbitrary constant.

b) Find the differential equation whose general solution is $y = A \cos(\log x) + B \sin(\log x)$, where A & B are arbitrary constants.

c) Find the integrating factor of the differential equation $\frac{dy}{dx} + \frac{y}{1+x^2} = x^2$.

d) Find the differential equation of orthogonal trajectories of family of curves $2x^2 + y^2 = cx$.

e) The temperature of the air is 30°C and the substance cools from 100°C to 70°C in 15 minutes. If differential equation by Newton's law of cooling is $\frac{d\theta}{dt} = -k(\theta - 30)$, then find the value of k .

f) Find the value of $\int_0^\infty e^{-2x} x^4 dx$

g) For the certain data if $a_0 = 1.5$, $a_1 = 0.373$, $b_1 = 1.004$ then find the amplitude of 1st harmonic.

h) If $I(a) = \int_0^{a^2} \tan^{-1} \left(\frac{x}{a} \right) dx$, then find $\frac{dI}{da}$.

i) Find the value of $\operatorname{erfc}(x) + \operatorname{erfc}(-x)$.

j) Choose the correct option for the following:

1) A double point is Cusp if,

a) Two branches have distinct tangents

b) Tangent line cuts the curve unusually

c) Two branches have a common tangent

d) None of the above

2) The parametric curve $x = f(t)$, $y = g(t)$ is symmetric about x -axis if,

a) $f(t)$ is even and $g(t)$ is an odd function of t

b) Both $f(t)$ and $g(t)$ are odd functions of t

c) $f(t)$ is an odd and $g(t)$ is even function of t

d) Both $f(t)$ and $g(t)$ are even functions of t