Code No: R10102 **R10** SET - 1

I B. Tech I Semester Supplementary Examinations, May/June - 2019
MATHEMATICS-I
(Com. to All branches)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Solve $x\frac{dy}{dx} + y = x^3y^6$. (8M)
   b) Suppose that an object is heated to 300^0F and allowed to cool in a room whose air temperature is 80^0F, if after 10 minutes the temperature of the object is 250^0F, what will be its temperature after 20 minutes. (7M)

2. a) Solve $(D^3 - 4D + 13)\, y = e^{2x}$. (8M)
   b) Solve $(D^2 + 3D + 2)\, y = 2\cos(2x + 3) + x\cos x$. (7M)

3. a) Find the maximum and minimum values of the function $f(x) = x^5 - 3x^4 + 5$. (8M)
   b) If $u = \frac{yz}{x}$, $v = \frac{xz}{y}$, $w = \frac{xy}{z}$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$. (7M)

4. a) Trace the curve $9ay^2 = x(x - 3a)^2$. (8M)
   b) Trace the curve $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$. (7M)

5. a) Find the surface area of the solid generated by revolving the arc of the parabola $x^2 = 12y$, bounded by its latus rectum about y-axis. (8M)
   b) Find the perimeter of the loop of the curve $3ay^2 = x(x - a)^2$. (7M)

6. a) Evaluate $\int_0^1 \int_x^{\sqrt{x}} x^2y^2(x + y)\,dy\,dx$. (8M)
   b) By changing the order of integration, evaluate $\int_0^1 \int_1^{2-x} xy\,dx\,dy$. (7M)

7. a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P=(1,2,3) in the direction of the line PQ where Q = (5,0,4). (8M)
   b) Prove that $grad(\bar{a}.\bar{b}) = (\bar{b}.\nabla)\bar{a} + (\bar{a}.\nabla)\bar{b} + \bar{b} \times curl\bar{a} + \bar{a} \times curl\bar{b}$. (7M)

8. a) Find the work done by $\bar{F} = (2x - y - z)\bar{i} + (x + y + z)\bar{j} + (3x - 2y - 5z)\bar{k}$ along a curve C in the xy – plane given by $x^2 + y^2 = 9$, z = 0. (8M)
   b) Use Gauss divergence theorem to evaluate $\iint_S (yz^2\bar{i} + zx^2\bar{j} + 2z^2\bar{k}).ds$, where S is the closed surface bounded by the xy - plane and the upper half of the sphere $x^2 + y^2 + z^2 = a^2$ above this plane. (7M)
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