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Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641043
Bachelor's Degree Examination - November 2017

I Semester

Class : I UG **Time :3 Hrs**
Major : Mathematics **Max.Marks :100**

15BMAC03 Differential Calculus

Part – A **10x1=10**
Choose the correct answer

1. Differentiation of any constant is ----------
   a. 1 b. 0
   c. constant d. none

2. If Y = $\sqrt{2x}$ find y_1
   a. $\frac{1}{\sqrt{2x}}$ b. $\frac{\sqrt{2}}{x}$
   c. $\frac{1}{\sqrt{x}}$ d. none

3. If V = $(x^2+y^2+z^2)$ -½ , $\frac{\partial v}{\partial x}$ = ----------
   a. $(x^2+y^2+z^2)^3/_2$ b. -x$(x^2+y^2+z^2)^{-3}/_2$
   c. x$(x^2+y^2+z^2)^3/_2$ d. none

4. ---------- rule is very useful in partial differentiation.
   a. Product b. Quotient
   c. Function of function d. none

5. The equation of four crisped hypocycloid is ----------
   a. $x^{2}/_3 + y^{2}/_3 = c^{2}/_3$ b. $x^{2}/_3 - y^{2}/_3 = c^{2}/_3$
   c. $x^{-2}/_3 + y^{-2}/_3 = c^{2}/_3$ d. $x^{1}/_3 + y^{1}/_3 = c^{1}/_3$

6. $\frac{\partial}{\partial y}(\frac{\partial u}{\partial x})$ = ----------
   a. $\frac{\partial u}{\partial y \partial x}$ b. $\frac{\partial^2 u}{\partial y \partial x}$
   c. $\frac{\partial^2 u}{\partial x \partial y}$ d. none

7. If the curvature is $\frac{1}{p}$ then its radius of curvature is ---------
   a. p b. $\frac{1}{p}$
   c. p^2 d. $\frac{1}{p^2}$

8. Curvature of circle is ---------- of its radius.
   a. twice b. same
   c. reciprocal d. none

9. Chord of curvature parallel to Y-axis is ----------
   a. 2p Cos Ø b. 2p Sin Ø
   c. p Cos Ø d. p Sin Ø

10. $27ay^2 = 4(x-2a)^3$ is ----------
   a. parabola b. hyperbola
   c. semi cubical parabola d. none

Part – B 5x6=30

Answer the following

Answer should not exceed 400 words or two pages

11. a. Find Y_n when $Y = \frac{1}{x^2+a^2}$.

(or)

11. b. If Y = log (ax+b) then Y_n = ---------- .

12. a. If $u = \frac{xy}{x+y}$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = U$

(or)

12. b. If u = log $(x^3+y^3 + z^3-3xyz)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$.

13. a. Find the envelop of straight line $\frac{x}{a} + \frac{y}{b} = 1$ when $ab = c^2$, where c is constant.

(or)

13. b. Find the envelope of family of circles $(x-a)^2+y^2=29$, where 'a' is the parameter.

14. a. Prove that radius of curvature at any point of cycloid x = a (θ+Sin θ)and y = a(1-Cos θ) is 4a Cos $\frac{\theta}{2}$.

(or)

14. b. Find the co-ordinates of the centre of curvature of the curve xy=2 at the point (2,1).

15. a. Prove that the (p-r) equation of the cardiod r = a(1-Cos θ) is $p^2 = {}^{r^3}/_{2a}$.

(or)

15. b. Find the radius of curvature of the curve $r^2 = a^2$ Sin 2θ.

Part – C 5x12=60

Answer the following

Answer should not exceed 800 words or 4 pages

16. a. Find the n^{th} differential coefficient of $\text{Cos}^5 \theta \ \text{Sin}^7 \theta$.

(or)

16. b. If x = Sin θ, y = Cos pθ, prove that $(1-x^2)\, y_2 - xy_1 + p^2y = 0$.

17. a. If $U = \tan^{-1} \frac{x^3+y^3}{x-y}$, prove $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ = Sin2u.

(or)

17. b. Verify Euler's theorem when $U = x^3 + y^3 + z^3$ +3xyz.

18. a. Find the envelope of family of curves $\frac{x^2}{a^2} + \frac{y^2}{k^2-a^2} = 1$, where 'a' is the parameter.

(or)

18. b. Prove that $\frac{\partial f}{\partial \xi}\frac{\partial \xi}{\partial \alpha} + \frac{\partial f}{\partial \eta}\frac{\partial \eta}{\partial \alpha} = 0$.

19. a. i) Derive the Cartesian formula for radius of curvature.
ii) Find p at the point 't' of the curve
X = a(Cost + t Sint); Y = a(Sint – t Cost)

(or)

19. b. Show the evolute of the cycloid X = a($\theta - Sin\theta$); Y = a(1-Cosθ) is another cycloid.

20. a. i) From the polar equation of Parabola, show that p^2 = ar.
ii) Find the radius of curvature of the cardiod r = a(1-Cosθ).

(or)

20. b. Show that the chord of curative through focus of Parabola is four times the focal distance of the point.