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# ST. XAVIER'S COLLEGE (AUTONOMOUS)

**1st SEMESTER EXAMINATION  
B.B.A.  
NOV - DEC 2010**

**BUSINESS MATHEMATICS - I**

**BSMA3101**

Tuesday, December 07, 2010 9:30 am to 11:30 am

Time allowed: **2 hours**

Full Marks:

### **Instructions:**

- Use fountain pen or ball-point pen of blue or black ink.
- Answer in your own words as far as practicable.
- Do not write anything on the Question paper other than your Roll No.

Answer **QUESTION NO.1** and **ANY FIVE** from the rest.

1. Answer **ANY FIVE** questions. [5x2 = 10]
- (a) If the 6<sup>th</sup> and 9<sup>th</sup> terms of a G.P. are 64 and 512 respectively, find its first term.
- (b) If the equation  $x^2 + 2(m + 2)x + 9m = 0$  has equal roots, find  $m$ .
- (c) If  ${}^n P_r = 272$  and  ${}^n C_r = 136$ , find  $r$ .
- (d) Find  $\log_8 27$ , given  $\log_2 3 = a$ .
- (e) If the sum of the binomial coefficients in the expansion of  $(x^2 - \frac{1}{x})^n$  is 256, find the 4<sup>th</sup> term of the expansion.
- (f) Find the domain of the function  $f(x) = \frac{1}{\sqrt{x^2 - x - 2}}$ .
- (g) Examine the existence of  $\lim_{x \rightarrow 0} \frac{|x|}{x}$ .
- (h) Find  $f'(1)$  when  $f(x) = \frac{1}{1 - \log x}$ .
2. (a) Three numbers are in A.P. and their sum is 21. If 1,5,15 be added to them respectively, they form a G.P. Find the numbers.
- (b) If  $\alpha, \beta$  be the roots of the equation  $x^2 - px + q = 0$ , find the equation whose roots are  $\alpha + \frac{1}{\beta}$  and  $\beta + \frac{1}{\alpha}$ . [4+4 = 8]
3. (a) Prove that  $(2n)! = \{1.3.5 \dots (2n - 1)\}. 2^n . n!$
- (b) A lamp lighter has to light 100 gas lamps. He takes 1.5 minutes to go from one lamp to the next. Each lamp burns 10c.c. of gas per hour. How many c.c. of gas has been burnt by 8-30 p.m. if he lights the first lamp at 6 p.m.? [4+4 = 8]
4. (a) If  $a^2 + b^2 = 7ab$ , show that  $\log \left\{ \frac{1}{3}(a + b) \right\} = \frac{1}{2}(\log a + \log b)$ .
- (b) If the coefficients of second, third and fourth terms in the expansion of  $(1 + x)^n$  be in A.P., prove that  $n = 7$ . [4+4 = 8]
5. (a) How many combinations can be formed from ten counters marked 1,2,3, ..., 10 taking 4 at a time selecting at least one odd and at least one even counter?
- (b) If  $(1 + x)^n = C_0 + C_1 x + C_2 x^2 + \dots + C_n x^n$ , prove that  $C_0 + \frac{C_1}{2} + \frac{C_2}{3} + \dots + \frac{C_n}{n+1} = \frac{2^{n+1} - 1}{n+1}$ . [4+4 = 8]
6. (a) If  $f(x) = \frac{ax+b}{bx-a}$ , prove that  $f \left\{ f \left( \frac{1}{x} \right) \right\} = \frac{1}{x}$ .
- (b) Find (i)  $\lim_{x \rightarrow 2} \frac{\sqrt{x+1} - \sqrt{3}}{x-2}$  (ii)  $\lim_{x \rightarrow 0} \frac{12^x - 3^x - 4^x + 1}{x^2}$ . [4+4 = 8]
7. (a) A function is defined by  $f(x) = |x - 2| + 1$  over all real values of  $x$ . Show that  $f(x)$  is continuous at  $x = 2$ .
- (b) If  $x^y = e^{x-y}$ , prove that  $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$ . [4+4 = 8]
8. (a) Applying first principle find the derivative of  $e^{5x}$ .
- (b) If  $y = (x + \sqrt{1 + x^2})^2$ , prove that  $(1 + x^2) \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = 0$ . [4+4 = 8]
9. (a) If  $\lim_{x \rightarrow 2} \frac{ax^2 - b}{x - 2} = 4$ , find the values of  $a$  and  $b$ .
- (b) If  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , show that  $\frac{d^2 y}{dx^2} = -\frac{b^4}{a^2 y^3}$ . [4+4 = 8]

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