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| <b>Ministry Of Higher Education</b><br><b>Higher Institute of Engineering</b><br><b>October 6 City</b><br><b>Department of Basic Science</b>   | <br>مدينة الثقافة و العلوم | <b>Prep. Year: Final Exam</b><br><b>Mathematics: (Calculus I)</b><br><b>Course Code: BAS 111</b><br><b>Date: January, 2014</b> |
| الزمن: 3 ساعات   | الامتحان (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة  | Marks  |
| [1] Find $y'$ from the following:<br>(a) $y = 2x^4 + 3 \cos x$ (b) $y = 3^x \cdot \operatorname{sech} x$ (c) $y = \sinh x + \ln(x + \cos x)$<br>(d) $y = \sqrt{x} + \tan^{-1} 3x$ (e) $y = \frac{\log x}{2x + \tan x}$ (f) $y = \sin^{-1} x + \sin^{-2} x$ |   | 12   |
| [2](a) Write the membership table of the statement: $S = (A - B) \cup (A \cap C)$  |   | 4  |
| (b) Evaluate the limits: (i) $\lim_{x \rightarrow 0} \frac{x - \tan x}{x - \sin x}$ (ii) $\lim_{x \rightarrow 0} \frac{x^2}{e^x - x - 1}$  |   | 4  |
| (c) Determine maximum, minimum and inflection points of: $(x) = x^3 - 12x$ .   |   | 4  |
| [3](a) Find $y'$ where: $y = t^2 + \sec^{-1} t$ , $x = 2t + \operatorname{sech} t^2$ .   |   | 3  |
| (b) Find $y'$ from the equation: $y^3 = x \sinh y + 3^x$ .   |   | 3  |
| (c) Write the Maclurin's expansion the function $f(x) = x + \ln(x + 1)$ .  |   | 4  |
| [4] Find the following integrals:  |   | 12   |
| (a) $\int (3x^3 + \sinh x) dx$ (b) $\int \left( \frac{1}{1+x^2} + \frac{2x}{\sqrt{1+x^2}} \right) dx$ (c) $\int (2 - 3^x)^2 dx$  |   |  |
| (d) $\int \frac{x}{x^2 - 3x - 4} dx$ (e) $\int x \cdot \cos x dx$ (f) $\int (\sin 3x \cdot \cos x) dx$   |   |  |
| [5](a) Find the integral $\int \cos^5 x dx$  |   | 5  |
| (b) Find the area of the region between the curve $y = x^3 - 1$ , x- axis, $x$ in $[0, 2]$ .   |   | 3  |
| (c) If the region between the curve $y = 2 + x^2$ , x-axis, $x$ in $[0, 1]$ is rotated about (i) x-axis      (ii) y-axis.  |   | 6  |
| Find the volume of the generated solid in both cases.  |   |  |

*Good Luck*

*Dr. Mohamed Eid*