

Birla Institute of Technology & Science, Pilani (Raj.)

Second Semester 2016-2017, BITS F114 (General Mathematics II)

End Semester Examination

Time: 180 Min.

Date: May 05, 2017 (Friday)

Max. Marks: 40

1. Write solution of each question on fresh page.
2. All questions are compulsory and carry equal marks.

CLOSED BOOK QUESTIONS

Q. 1 Show that the function $v(x, y) = e^x \sin y$ is harmonic. Find its conjugate harmonic function $u(x, y)$.

Q. 2 Show that the function

$$f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & z \neq 0 \\ 0 & z = 0 \end{cases}$$

is not differentiable at $z = 0$.

Q. 3 Solve $\sec^2 y \frac{dy}{dx} + \tan y = x^3$.

Q. 4 Find integrating factor so that the differential equation $(3x^2 - y^2)dy - 2xydx = 0$ is exact, and hence solve it.

Q. 5 Use the method of variation of parameters to solve $y'' + y = \csc x$.

OPEN BOOK QUESTIONS

Q. 1 Find $f_x(0, y)$ and $f_y(x, 0)$ from

$$f(x, y) = \begin{cases} \frac{xy(2x^2-3y^2)}{x^2+y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

Q. 2 Find the extremum values of $x^3 + y^3 - 3axy$.

Q. 3 Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy \, dy \, dx$, and hence evaluate the same.

Q. 4 Use Laplace transform to solve the differential equation

$$\frac{d^2x}{dt^2} + 9x = \cos 2t \text{ with the conditions } x(0) = 1 \text{ and } x(\pi/2) = -1.$$

Q. 5 Find the inverse Laplace transform of $\frac{s-1}{s(s^2+1)(s^2+2)}$.

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