

**B. N. BANDODKAR COLLEGE OF SCIENCE, THANE**  
 F.Y.B.SC. (INFORMATION TECHNOLOGY) SEMESTER – II EXAMINATION; APRIL  
 2015  
 COURSE CODE– USIT202

**Duration: 2½ Hrs**  
**Marks: 75**

**Total**

**N.B. 1. All questions are compulsory.**

- Q. 1**      **Answer any two out of following** **10**
- a    Express  $\frac{(3-4i)(1+i)}{2+3i}$  in polar form.
- b    Simplify  $\frac{3+2i}{(2+i)(1-3i)}$
- c    Find  $\sqrt{3-4i}$ .
- d    Find the conjugate of  $\frac{2+3i}{1-i}$ .
- Q. 2**      **Answer any two out of following** **10**
- a    Separate into real and imaginary parts:  $\cos(\alpha + i\beta)$ .
- b    Prove that,  $16\cosh^5 x = \cosh 5x + 5\cosh 3x + 10\cosh x$ .
- c    Show that given function is analytic and find it's derivative:  $\cosh z$
- d    Prove that,  $\sinh^{-1} x = \log(x + \sqrt{x^2 + 1})$
- Q. 3**      **Answer any two out of following** **10**
- a    Find the Laplace Transform of  $(e^t - 1)^3$
- b    Find the Laplace Transform of  $e^{2t} + 4t^3 - 2\sin 3t + 3\cos 3t$
- c    Find the Inverse Laplace Transform of  $\frac{4}{s-2} - \frac{3s}{s^2+16} + \frac{5}{s^2+4}$ .
- d    Find Laplace Transform of  $(1 + 2t - 3t^2 + 4t^3)H(t - 2)$  using Heaviside's Unit Step Function.
- Q. 4**      **Answer any two out of following** **10**
- a    Solve the integration:  $\frac{\sin \log x}{x}$
- b    Evaluate the given Integral:  $\int_0^\infty x^7 \cdot e^{-2x^2} dx$
- c    Evaluate  $\int_0^1 x^6 (1 - x^2)^{\frac{1}{2}} dx$
- d    Prove that  $\operatorname{erf}(-x) = -\operatorname{erf}(x)$ .
- Q. 5**      **Answer any two out of following** **10**
- a    Find the Fourier cosine Transform of  $f(x)$  if,  $f(x) = \begin{cases} 1, & 0 \leq x < 1 \\ 0, & x > 1 \end{cases}$
- b    Find the Fourier sine Transform of  $f(x)$  if,  $f(x) = \begin{cases} 1, & 0 \leq x < 1 \\ 0, & x > 1 \end{cases}$
- c    Find the Fourier Series for  $f(x)$  in  $(0, 2\pi)$  where  $f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi < x < 2\pi \end{cases}$

d Find  $f(x)$  if it's Fourier sine Transform is  $e^{-as}$ .

**Q. 6** Answer any two out of following

10

a Evaluate  $\int_0^1 dx \int_0^x e^{\frac{y}{x}} dy$

b Evaluate  $\int_0^1 \int_0^1 (x+2) dy dx$

c Evaluate  $\int_0^2 \int_1^2 \int_0^{yz} xyz dx dy dz$

d Evaluate  $\int_0^2 \int_0^x \int_0^{2x+2y} e^{x+y+z} dz dy dx$

**Q. 7** Answer any three out of following

15

a Expand in polar form,  $\frac{(1+i)^8(\sqrt{3}-i)^4}{(1-i)^4(\sqrt{3}+i)^8}$

b Prove that,  $\left(\frac{1+\tanh x}{1-\tanh x}\right)^n = \cosh 2nx + \sinh 2nx$

c Using the fundamental definition, find the laplace transform of  $f(t)$ , where  $f(t) = a$ , for  $0 < t < b$  and  $f(t) = 0$  for  $t > b$ .

d Compute erf (0.3) correct to three decimal places.

e Find  $f(x)$  if it's Fourier cosine Transform is

$$F_c(s) = \begin{cases} \frac{1}{\sqrt{2x}} \left(k - \frac{s}{2}\right), & \text{if } s < 2k \\ 0, & \text{if } s > 2k \end{cases}$$

f Evaluate  $\int_0^2 \int_0^{\sqrt{2x}} xy dy dx$

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