

**B.TECH. SEM -III ELECTRICAL/ ELECTRONICS / BIO MEDICAL /
E & TC) 2014 COURSE (CBCS) : WINTER - 2017
SUBJECT : ENGINEERING MATHEMATICS - III**

Day : **Friday**
Date : **12/01/2018**

W-2017-2032

Time : **10.00 AM TO 01.00 PM**
Max. Marks : 60

N. B. ;

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Non-programmable calculator is **ALLOWED**.

Q.1 a) Solve $(D^3 + 4D)y = \sin 5x \cdot \cos 3x$ (05)

b) Solve $(D^2 + 3D + 2)y = e^{e^x} + \cos e^x$ by variation of parameters. (05)

OR

a) Solve: $\frac{dx}{xz} = \frac{dy}{yz} = \frac{2dz}{(x+y)^2}$ (05)

b) A capacitor of 10^{-3} farads is in the series with an e.m.f. of 20 volts and an inductor of 0.4h. The charge Q and current I are zero at $t = 0$, find Q at any time t. (05)

Q.2 a) If $f(z) = u + iv$ is an analytic function, find it, (05)
if $u - v = x^3 + 3x^2y - 3xy^2 - y^3$.

b) Find the bilinear transformation that maps the points $\infty, i, 0$ of z -plane into the points $0, i, \infty$ of w -plane. (05)

OR

a) Evaluate $\int_C \frac{\sin\left(\frac{\pi z}{2}\right)}{(z-i-1)(z^3-1)} dz$, where C is a rectangle with vertices at $-i, 2+2i, 2i, 2-i$. (05)

b) Solve $\int_0^{2\pi} \frac{\cos 2\phi}{3 + 2 \cos \phi} d\phi$ (05)

Q.3 Find the Fourier transform of $f(x) = e^{-x^2}$ (10)

P. T. O.

OR

a) Find z – transform of $f(k) = \begin{cases} -\left(\frac{-1}{3}\right)^k & k < 0 \\ \left(\frac{-1}{4}\right)^k & k \geq 0 \end{cases}$ (05)

b) Find the z-transform of $f(k) = k 4^k, (k \geq 0)$. (05)

Q. 4 a) Find the Laplace transform of the function (05)

$$f(t) = te^{-t} \sin 2t$$

b) Find $L\{F(t)\}$ if (05)

$$F(t) = \begin{cases} \sin\left(t - \frac{\pi}{3}\right), & t > \frac{\pi}{3} \\ 0, & t < \frac{\pi}{3} \end{cases}$$

OR

a) Obtain the inverse Laplace transform of $\cot^{-1}\left(\frac{s+3}{2}\right)$. (05)

b) Find the inverse Laplace transform of $\frac{2as}{(s^2 + a^2)^2}$ (05)

Q. 5 a) For the curve $x = \cos t + t \sin t, y = \sin t - t \cos t$. Find the tangential and normal components of acceleration at any time t . (05)

b) Find the directional derivative of $\phi = xy^2 + yz^3$ at $(4, -1, 1)$ along the direction normal to the surface $x^2 + y^2 + z^2 = 9$ at $(1, 2, 2)$. (05)

OR

Show that the vector field $f(r)\bar{r}$ is always irrotational and determine $f(r)$ such that the field is solenoidal. Also find $f(r)$ such that $\nabla^2 f(r) = 0$. (10)

Q. 6 Verify Stoke's theorem for $\bar{F} = xy^2\bar{i} + y\bar{j} + xz^2\bar{k}$ for the surface of rectangular lamina bounded by $x = 0, y = 0, x = 1, y = 2, z = 0$. (10)

OR

Using Green's theorem, show that the area bounded by a simple closed curve C is given by $\frac{1}{2} \int x dy - y dx$. (10)

Hence find the area of the ellipse $x = a \cos \phi, y = b \sin \phi$.

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