

Total Pages-4 III-Sem/MECH/ELE/ETC/CSE/  
IT/AUTO/AEI/ELE & MECH/  
PT-MECH/PT-ELE/2014(W)(New)

## ENGG MATHEMATICS-III

(Code – BST-301)

Full Marks : 70

Time : 3 hours

Answer any five questions

Figures in the right-hand margin indicate marks

1. (a) Determine the rank of the matrix : 2

$$\begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$$

- (b) Find the Laplace transform of  $(e^{at} - \cos bt)/t.$  5

- (c) Solve :  $(D^2 + 4)v = e^x \sin^2 x.$  7

( Turn Over )

( 2 )

2. (a) Find the Fourier co-efficient  $a_0$  for obtaining a Fourier series for  $f(x) = e^{-x}, 0 < x < 2\pi.$  2

- (b) Find a root of  $x^3 - x - 11 = 0,$  using bisection method. 5

- (c) Solve :

$$x(y^2 - z^2)p + y(z^2 - x^2)q - z(x^2 - y^2)r = 0. \quad 7$$

3. (a) Find the complementary function of

$$(D^2 - 2D + 2)y = \sin 3x. \quad 2$$

- (b) Find the inverse Laplace transform of

$$\log\left(\frac{1+S}{S}\right). \quad 5$$

- (c) Express  $f(x) = |x|$  as a Fourier series in  $-\pi < x < \pi.$  7

4. (a) Form the partial differential equation by eliminating arbitrary functions from

$$Z = f\left(\frac{y}{x}\right). \quad 2$$

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(b) Evaluate :

$$\int_0^4 e^x dx,$$

using Simpson's  $\frac{1}{3}$  rd rule, taking  $h = 1.$  5

(c) Solve the following equation by the transform method :

$$y'' - 3y' + 2y = e^{3t}, y(0) = 1 \text{ & } y'(0) = 0. \quad 7$$

5. (a) Solve : 2

$$p - q = z.$$

(b) Find a Fourier sine series to represent  $f(x) = x$  in  $0 < x < \pi.$  5

(c) Find the cube root of 41 using Newton-Raphson method. 7

6. (a) Evaluate : http://www.sctevtonline.com 2

$$\Delta \tan^{-1} \left( \frac{n-1}{n} \right)$$

(b) Solve : 5

$$\frac{d^2y}{dx^2} + 16y = x \sin 3x.$$

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(c) Find the inverse Laplace transform of

$$\frac{s}{(s-3)(s^2+4)}.$$

7. (a) Find :

$$L\left\{\frac{1}{\sqrt{t}}\right\}.$$

(b) Solve :

$$xp - yq = y^2 - x^2.$$

(c) Investigate for what values of  $\lambda$  and  $\mu$  the simultaneous equations

$$x + y + z = 6, \quad x + 2y + 3z = 10, \\ x + 2y + \lambda z = \mu$$

have (i) no solution

(ii) a unique solution

(iii) an infinite number of solution.