

Code: 9ABS301

**R09**

B.Tech II Year I Semester (R09) Supplementary Examinations June 2016

**MATHEMATICS - II**

(Common to AE, BT, CE &amp; ME)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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- 1 (a) Find the Eigen values and the corresponding Eigen vectors of the matrix  $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ .
- (b) If  $\lambda$  is a Eigen value of a non singular matrix A, show that  $\frac{|A|}{\lambda}$  is an Eigen value of the matrix adj A.
- 2 Reduce the quadratic form  $3x^2 + 5y^2 + 3z^2 - 2xy + 2xz - 2yz$  to canonical form by orthogonal transformation.
- 3 (a) Show that for  $-\pi < x < \pi$ ,
 
$$\sin ax = \frac{2 \sin a \pi}{\pi} \left[ \frac{\sin x}{1^2 - a^2} - \frac{2 \sin 2x}{2^2 - a^2} + \frac{3 \sin 3x}{3^2 - a^2} - \dots \right]$$
- (b) Obtain The Fourier series for the function  $f(x) = \frac{1}{2}(\pi - x)$  in  $(0, 2\pi)$ .
- 4 (a) Find the finite sine transform of  $\cos ax$ ,  $0 < x < \pi$ .
- (b) Find  $f(x)$ , if its transform is  $F_s(s) = F_s\{f(x)\} = \frac{1 - \cos s\pi}{s^2 \pi^2}$ ,  $0 < x < \pi$ ,  $s=1,2,3,\dots$
- 5 Find the temperature in a thin metal rod of length L, with both ends insulated and with initial temperature  $\sin\left(\frac{\pi x}{L}\right)$ .
- 6 (a) Find a real root of the equation  $x^3 - 5x + 3 = 0$  using bisection method.
- (b) If  $f(x) = u(x) v(x)$  show that  $f[x_0, x_1] = u[x_0] \cdot v[x_0, x_1] + u[x_0, x_1]v[x_1]$ .
- 7 (a) Fit a least square parabola of the form  $ax^2 + bx + c$  to the following data:
 

|   |   |   |   |   |    |    |    |
|---|---|---|---|---|----|----|----|
| x | 0 | 1 | 2 | 3 | 4  | 5  | 6  |
| y | 3 | 3 | 5 | 9 | 15 | 23 | 33 |
- (b) Find  $\frac{dy}{dx}$  at  $x = 7.5$  from the following table:
 

|   |       |       |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|-------|-------|
| x | 7.47  | 7.48  | 7.49  | 7.5   | 7.51  | 7.52  | 7.53  |
| y | 0.193 | 0.195 | 0.198 | 0.201 | 0.203 | 0.206 | 0.208 |
- 8 Find the solution of  $\frac{dy}{dx} = x - y$ ,  $y(0) = 1$  at  $x = 0.1, 0.2, 0.3, 0.4$  and  $0.5$  using modified Euler's method.

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