

Roll No

BE - 301**B.E. III Semester** Examination, December 2014**Mathematics - II**

(Common for all Branches)

Time : Three Hours**Maximum Marks : 70**

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
- ii) All parts of each question are to be attempted at one place.
- iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
- iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Write the Euler's formula to find Fourier series?
- b) Define Fourier transform and give the shifting property for Fourier transform?
- c) Find the Fourier sine transform of <http://www.rgpvonline.com>

$$f(x) = \begin{cases} \sin x & , 0 < x < a \\ 0 & , x > a \end{cases}$$

- d) Find the Fourier series for the periodic function $f(x)$ defined by

$$f(x) = \begin{cases} -\pi & \text{when } -\pi < x < 0 \\ x & \text{when } 0 < x < \pi \end{cases}$$

OR

Find a half range cosine series for

$$f(x) = \begin{cases} kx & , 0 \leq x \leq l/2 \\ k(l-x) & , l/2 \leq x \leq l \end{cases}$$

Unit - II

2. a) Find $L\{3t^4 - 2t^3 + 4e^{-3t} - 2\sin 5t + 3\cos 2t\}$.
- b) Explain first shifting property of Laplace transform.
- c) Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

$$d) \text{ Find } L^{-1}\left\{\frac{(2s+1)}{(s-1)^2(s+2)^2}\right\}$$

OR

Using convolution theorem evaluate

$$L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$$

Unit - III

3. a) Write the conditions for series solution of differential equation?
 b) Explain the regular and irregular singular points?
 c) Solve $\frac{d^2y}{dx^2} - \cot x \left(\frac{dy}{dx} \right) - (1 - \cos x)y = e^x \sin x$
 d) Solve $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = 0$ given that $\left(x + \frac{1}{x} \right)$ is one integral.

OR

$$\text{Solve } (2x + x^3) \frac{d^2y}{dx^2} - \frac{dy}{dx} - 6xy = 0$$

Unit - IV

4. a) Solve $p \tan x + q \tan y = \tan z$
 b) Solve $(y^2 + z^2 - x^2)p - 2xyq + 2zx = 0$
 c) Form the partial differential equation from the following relation $Z = f(x + iy) + F(x - iy)$
 Where f and F are arbitrary functions. <http://www.rgpvonline.com>
 d) Solve by Charpit's method
 $px + qy = pq$

OR

$$\text{Solve } pt - qs = q^3$$

Unit - V

5. a) If $r = xi + yj + zk$
 Then show that $\text{grad } r = \hat{r}$
 b) Find a unit normal vector normal to the surface $\phi = x^2 + y^2 - z$ at the point $(1, 2, 5)$
 c) If vector $F = (x + 3y)i + (y - 2z)j + (x + 9z)k$ is a solenoidal vector, then find the value of a ?
 d) Evaluate $\int_C F \cdot dr$ where $F = e^x \sin y i + e^x \cos y j$ and the vertices of rectangle C are $(0, 0)$ $(1, 0)$ $(1, \pi/2)$ $(0, \pi/2)$

OR

Evaluate $\iint_S A \cdot \hat{n} ds$ where $A = 18zi - 12j + 3yk$ and S is the part of the plane $2x + 3y + 6z = 12$.
