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

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

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

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

OR

Find a half range cosine series for

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

Unit - II

2. a) Find $L\left\{3t^4-2t^3+4e^{-3t}-2\sin 5t+3\cos 2t\right\}$.

   b) Explain first shifting property of Laplace transform.

   c) Evaluate $L\left\{\int_0^t \frac{\sin t}{t}dt\right\}$

   d) 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

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

Unit - IV

4. a) Solve $p\tan x + q\tan y = \tan z$

b) Solve $\left(y^2 + z^2 - x^2\right)p - 2xy\,q + 2zx = 0$

c) Form the partial differential equation from the following relation $Z = f(x+iy) + F(x-iy)$ Where f and F are arbitrary functions.

d) Solve by Charpit's method
$px + qy = pq$

OR

Solve $pt - qs = q^3$

Unit - V

5. a) If $r = xi + yj + zk$
Then show that 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 $\int_C F.dr$ where $F = e^x \sin y\, i + e^x \cos y\, j$ and the vertices of rectangle C are (0, 0) (1, 0) (1, π/2) (0, π/2)

OR

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

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