

4E4135

Roll No. \_\_\_\_\_

Total No of Pages: **4****4E4135****B. Tech. IV Sem. (Main/Back) Exam., June/July-2014****Petroleum Engg.****4PE1 Advanced Engineering Mathematics-II/Mathematics-IV****Common with AI, BM, EI, CRE, EC, PE****Time: 3 Hours****Maximum Marks: 80****Min. Passing Marks: 24****Instructions to Candidates:-**

*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/ calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.*

*(Mentioned in form No.205)*

1. \_\_\_\_\_ NIL \_\_\_\_\_

2. \_\_\_\_\_ NIL \_\_\_\_\_

**UNIT – I**

Q.1 (a) In an examination, the number of candidates who obtained marks between certain limits were as follows: [8]

Marks	No. of Candidates
0-19	41
20-39	62
40-59	65
60-79	50
80-99	17

Estimate the number of candidates securing marks below 70.

(b) Find the value of  $f(6)$ , given that:

[8]

x :	3	7	9	10
y :	168	120	72	63

**OR**

Q.1 (a) Estimate the value of  $f(7.5)$ , given that:

[8]

x :	1	2	3	4	5	6	7	8
y :	1	8	27	64	125	216	343	512

(b) Use Stirling's formula to find  $u_{11}$ , given:

[8]

$$\begin{aligned}
 u_0 &= 3010, & u_5 &= 2710, & u_{10} &= 2285 \\
 u_{15} &= 1860, & u_{20} &= 1560, & u_{25} &= 1510 \\
 u_{30} &= 1835.
 \end{aligned}$$

## **UNIT - II**

Q.2 (a) Show that  $\int_0^1 \frac{dx}{1+x} = \log_e 2 = 0.69315$  by using Simpson's " $\frac{1}{3}$ " rule. [8]

(b) Solve the equation  $\frac{dy}{dx} = x+y$ ; with initial condition  $y(0) = 1$  by Runge Kutta fourth order method, for  $x = 0$  to  $x = 0.2$  with  $h = 0.1$  (8)

**OR**

- (a) Find the first derivative of  $f(x)$  at  $x = 0.4$  from the following table: [8]

$x :$	0.1	0.2	0.3	0.4
$f(x):$	1.10517	1.22140	1.34986	1.49182

- (b) Using Milne's method to find  $y(2)$ , if  $y(x)$  is the solution of  $\frac{dy}{dx} = \frac{1}{2}(x+y)$  assuming  $y(0) = 2$ ,  $y(0.5) = 2.636$ ,  $y(1.0) = 3.595$ , and  $y(1.5) = 4.968$ . [8]

**UNIT – III**

- Q.3 (a) State and prove orthogonal property of Legendre function. [8]  
 (b) For Bessel function, prove that [8]

$$\frac{d}{dx} [x^n J_n(x)] = x^n J_{n-1}(x) ; n \geq 0$$

**OR**

- Q.3 (a) State and prove orthogonal property of Bessel's function. [8]  
 (b) For Legendre function, prove that  $nP_n(x) = (2n-1)P_{n-1}(x) - (n-1)P_{n-2}(x)$  [8]

**UNIT – IV**

- Q.4 (a) A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six. [8]  
 (b) For a bivariate distribution,  $n = 18$ ,  $\Sigma x = 12$ ,  $\Sigma y = 18$ ,  $\Sigma xy = 48$ ,  $\Sigma x^2 = 60$ ,  $\Sigma y^2 = 96$ . Find the equations of lines of regression and correlation coefficient  $r$ . [8]

**OR**

- Q.4 (a) In a book of 520 pages, 390 typographical errors occur. Assuming Poisson's law for the numbers of errors per page, find the probability that a random sample of 5 pages will contain no error. [8]
- (b) Derive the expected value (mean) for Binomial distribution. [8]

**UNIT – V**

- Q.5 (a) Obtain the shortest distance curve between two given points in a plane. [8]
- (b) Solve Euler's equation for the functional: [8]

$$F = \int_A^B y(1 - y'^2)^{1/2} dx$$

**OR**

- Q.5 (a) Derive Euler's equation. [8]
- (b) Find the extremals of the functional

$$\int_A^B \frac{1}{y} (1 + y'^2) dx,$$

Where A is (-1, 1) and B is (1, 1). [8]