



FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

EEE401- MATHEMATICS FOR TECHNICIAN 1

FINAL EXAMINATION – SEMESTER 1, 2013

Day/Date: As per timetable Time: 3 Hours10Min Room: As per timetable

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate ID-number at the top of each attached sheet
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string
5. For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. ANSWER ALL QUESTIONS.
8. Show all workings where necessary.
9. You can use calculators but programmable calculators not allowed, especially the ones that does the conversions of number systems.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!**

SECTION A

[12 MARKS]

Show all necessary working. (Each question carries 3 marks).

1. Evaluate using the law of indices and write answer with positive indices: [4 marks]

$$\frac{\left(\frac{2}{3}\right)^{-2} \times \left(\left(\frac{5}{2}\right)^2\right)^{-2}}{\left(\frac{3}{2}\right)^3 \times 5^{-5}}$$

2. Divide $(x^3 - 2x^2 - 5x + 6)$ by $(x-1)$. [4 marks]

3. Evaluate $\frac{\log 25 - \log 125 + \frac{1}{2} \log 625}{3 \log 5}$ using logarithmic properties. [4 marks]

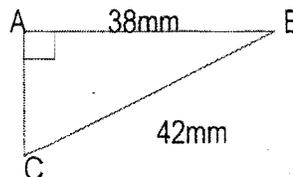
SECTION B

[32 MARKS]

Show all necessary working. (Each question carries 4 marks).

1. a) An ammeter has a range from 0 to 10A with an accuracy of $\pm 0.1\%$. When the reading is 4A, what is the possible range of the true value of the current? [2 marks]
 b) Express the following in standard form: [2 marks]
 i) 338.3
 ii) 0.0000535

2. a) Find all the remaining sides and angles of given triangle :



[2 marks]

- b) Use quadratic formula to solve $2x^2 + 7x = 18$ [2 marks]

3. Multiply 15.28 by 48.35 using log and antilog table. [4 marks]

4. A main shaft is running at 300rev/min and a machine is to be installed driven directly from the shaft, to run at 180rev/min. The pulley on the machine is 230 mm diameter. What diameter of pulley will be required on the shaft to drive the machine? [4 marks]

5. Make C_2 the subject of the formula from the equation $c = c_1 + \frac{c_2 c_3}{c_2 + c_3}$ [4 marks]

6. The weekly wage bill for three instructors and thirty apprentices in a mechanical training workshop is \$4341. In an electrical training centre the wage bill is \$2664 for two instructors and eighteen apprentices. If the five instructors each receive the same pay, and the forty-eight apprentices each receive the same pay, calculate the weekly wage of an instructor and the weekly wage of an apprentice. [4 marks]

7. Find Integral coefficient of $\int \frac{2x^3 - 3x}{4x} dx$ [4 marks]

8. The value of alternating current, iA , in a circuit, after time t sec is given by, $i=40 \sin 100\pi t$. Calculate:
 a) periodic time [1 marks]
 b) the time when the current first reaches 8A. [3 marks]

SECTION C Show all necessary working. (Each question carries 6 marks). [36 MARKS]

1. The circuit in figure 1 shows three resistors (R_1, R_2 and R_3) connected in series. The supply voltage for the circuit is denoted as V_s .

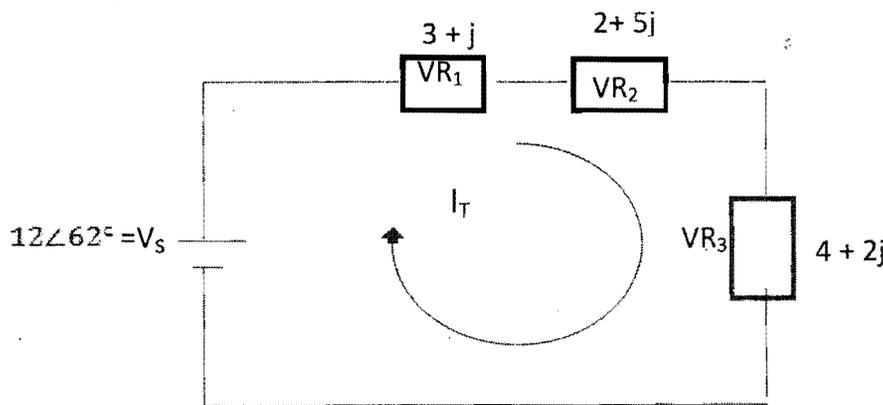


Figure 1: Resistance connected in series

(a) Calculate the circuit resistance R_T ? [2 marks]

(b) Calculate circuit current I_T ? [4 marks]

2. a) A football stadium's floodlights can spread its illumination over an angle of 45° to a distance of 55 m. Determine the maximum area that is floodlit. [3 marks]

b) a hall is of length 16m , breadth 14m & height 5m . Calculate the no: of persons that can be accommodated in the hall , assuming 3.5m³ of air is required for each person. [3 marks]

3. Resolve into partial fractions: $\frac{x^3 - 6x + 9}{x^2 + x - 2}$ [6 marks]

4. Find the derivative of $y = (4t^3 - 3t)^6$ [6 marks]

5. A ladder 3.5m long is placed against a perpendicular wall with its foot 1.0m from the wall. How far up the wall (to the nearest centimeter) does the ladder reach? If the foot of the ladder is now moved 30 cm further away from the wall, how far does the top of the ladder fall? [6 marks]
6. Find the differential coefficient of $y = \frac{\cos 4x}{(2x^2 + 1)^2}$ [6 marks]

SECTION D Show all necessary working. (Each question carries 10 marks). [20 MARKS]

1. The instantaneous value of voltage in an a.c. circuit at any time t seconds is given by $v=340 \sin (50\pi t -0.541)$ volts.

Determine the: [10 marks]

- Amplitude, periodic time, frequency and phase angle (in degrees)
- Value of the voltage when $t=0$
- Value of the voltage when $t=10$ ms
- Time when the voltage first reaches 200V, and
- Time when the voltage is a maximum

2. Sketch the following: [10 marks]

- Sketch the sinusoidal function $y = 7 \sin (2A - \pi/3)$ in the range $0 \leq A \leq 360^\circ$.
- Sketch the curve for exponential function $y = 18^{3x+2}$.

*****THE END*****

LOGARITHMS										— Mean Differences —									
0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	28	30	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	18	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2121	2148	2174	2200	2226	2251	2276	2	5	7	10	13	16	19	22	25
17	2301	2326	2351	2375	2400	2424	2448	2472	2496	2520	2	5	7	10	13	16	19	22	25
18	2543	2566	2589	2612	2635	2657	2680	2702	2724	2746	2	5	7	10	13	16	19	22	25
19	2768	2789	2810	2831	2851	2872	2892	2912	2932	2952	2	5	7	10	13	16	19	22	25
20	2972	2991	3010	3029	3048	3066	3085	3103	3121	3139	2	5	7	10	13	16	19	22	25
21	3157	3174	3191	3208	3225	3242	3258	3275	3291	3307	2	5	7	10	13	16	19	22	25
22	3323	3338	3353	3368	3383	3398	3413	3428	3442	3457	2	5	7	10	13	16	19	22	25
23	3471	3485	3499	3513	3527	3541	3555	3569	3582	3596	2	5	7	10	13	16	19	22	25
24	3609	3622	3635	3648	3661	3674	3687	3699	3712	3724	2	5	7	10	13	16	19	22	25
25	3736	3748	3760	3772	3784	3796	3808	3819	3830	3841	2	5	7	10	13	16	19	22	25
26	3852	3863	3874	3885	3896	3906	3917	3927	3937	3947	2	5	7	10	13	16	19	22	25
27	3957	3967	3977	3987	3997	4007	4016	4026	4035	4044	2	5	7	10	13	16	19	22	25
28	4053	4062	4071	4080	4089	4098	4107	4116	4125	4134	2	5	7	10	13	16	19	22	25
29	4142	4151	4159	4168	4177	4186	4194	4203	4211	4220	2	5	7	10	13	16	19	22	25
30	4228	4236	4244	4252	4260	4268	4276	4284	4292	4300	2	5	7	10	13	16	19	22	25
31	4308	4315	4323	4330	4337	4344	4351	4358	4365	4372	2	5	7	10	13	16	19	22	25
32	4379	4385	4392	4398	4405	4411	4418	4424	4430	4436	2	5	7	10	13	16	19	22	25
33	4442	4448	4454	4460	4466	4472	4478	4483	4489	4495	2	5	7	10	13	16	19	22	25
34	4500	4506	4512	4518	4523	4529	4534	4540	4545	4551	2	5	7	10	13	16	19	22	25
35	4556	4562	4567	4573	4578	4583	4589	4594	4599	4604	2	5	7	10	13	16	19	22	25
36	4609	4614	4619	4625	4630	4635	4640	4645	4650	4655	2	5	7	10	13	16	19	22	25
37	4660	4665	4670	4675	4680	4685	4690	4695	4700	4705	2	5	7	10	13	16	19	22	25
38	4710	4715	4720	4725	4730	4735	4740	4745	4750	4755	2	5	7	10	13	16	19	22	25
39	4760	4765	4770	4775	4780	4785	4790	4795	4800	4805	2	5	7	10	13	16	19	22	25
40	4810	4815	4820	4825	4830	4835	4840	4845	4850	4855	2	5	7	10	13	16	19	22	25
41	4860	4865	4870	4875	4880	4885	4890	4895	4900	4905	2	5	7	10	13	16	19	22	25
42	4910	4915	4920	4925	4930	4935	4940	4945	4950	4955	2	5	7	10	13	16	19	22	25
43	4960	4965	4970	4975	4980	4985	4990	4995	5000	5005	2	5	7	10	13	16	19	22	25
44	5010	5015	5020	5025	5030	5035	5040	5045	5050	5055	2	5	7	10	13	16	19	22	25
45	5060	5065	5070	5075	5080	5085	5090	5095	5100	5105	2	5	7	10	13	16	19	22	25
46	5110	5115	5120	5125	5130	5135	5140	5145	5150	5155	2	5	7	10	13	16	19	22	25
47	5160	5165	5170	5175	5180	5185	5190	5195	5200	5205	2	5	7	10	13	16	19	22	25
48	5210	5215	5220	5225	5230	5235	5240	5245	5250	5255	2	5	7	10	13	16	19	22	25
49	5260	5265	5270	5275	5280	5285	5290	5295	5300	5305	2	5	7	10	13	16	19	22	25
50	5310	5315	5320	5325	5330	5335	5340	5345	5350	5355	2	5	7	10	13	16	19	22	25