FE (All Branches) 07/12/16
old

T0111 Applied Maths I

QP Code : 528102

OLD COURSE

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question no. **1** is **compulsory.**
(2) Attempt **any four** questions from **two** to **seven.**
(3) Answer to subquestion should be written together

1. (a) If $z=\frac{1}{\sqrt{2}}+i\frac{1}{\sqrt{2}}$ then find $(z)^{10}+(\bar{z})^{10}$. **3**

(b) Find the y_n; if $y=\cos x \cos 2x \cos 3x$ **3**

(c) Prove that $\bar{d}.\{\bar{a}\,x[\bar{b}x(\bar{c}x\bar{d})]\}=(\bar{b}.\bar{d})[\bar{a}\,\bar{c}\,\bar{d}]$ **3**

(d) Prove that $\tan^{-1}x = x-\frac{x^3}{3}+\frac{x^5}{5}-\frac{x^7}{7}+....$ **3**

(e) If $v = [1-2xy+y^2]^{-1/2}$ then show that **4**

$$x\frac{\partial v}{\partial x}-y\frac{\partial v}{\partial y}=y^2v^3$$

(f) Divide 24 into three Parts such that the continued product of the first, square of the second and cube of the third is minimum. **4**

2. (a) Prove that $\frac{1+\cos\alpha+i\sin\alpha}{1-\cos\alpha+i\sin\alpha}=\cot\left(\frac{\alpha}{2}\right)e^{i\left(\alpha-\frac{\pi}{2}\right)}$ **6**

(b) If $\alpha+i\beta=\tan h\,(x+i\frac{\pi}{4})$, prove that $\alpha^2+\beta^2=1$. **6**

(c) If $u=\frac{x^2y^2z^2}{x^2+y^2+z^2}+\cos\left[\frac{xy+yz+zx}{x^2+y^2+z^2}\right]$ **8**

then find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}$

[TURN OVER]

3. (a) Verify Rolle's Theorem for 6

$f(x)=e^x(\sin x-\cos x)$ in $\left[\frac{\pi}{4},\frac{5\pi}{4}\right]$

(b) Prove that $[\bar{a}\,\bar{b}\,\bar{c}]^2=(\bar{a}x\bar{b}).[(\bar{b}x\bar{c})x(\bar{c}x\bar{a})]$ 6

(c) Prove that $\log(1+e^x)=\log 2+\frac{1}{2}x+\frac{1}{8}x^2-\frac{1}{192}x^4+....$ 8

4. (a) Find the roots of $x^6-i=0$ 6

(b) Test the convergence of $\sum\left[\frac{3^n+4^n}{4^n+5^n}\right]$ 6

(c) If $y=\left[\log\left(x+\sqrt{x^2+1}\right)\right]^2$, Show that $y_{n+2}(0)=-n^2y_n(0)$. 8

5. (a) Find n^{th} derivative of $\frac{x^2}{(x+2)(2x+3)}$ 6

(b) Evaluate $\lim_{x\to 0}\left[\operatorname{cosec}^2 x-\frac{1}{x^2}\right]$ 6

(c) Find divergence $\bar{F}$ and curl $\bar{F}$ where 8

$\bar{F}=\nabla(x^3+y^3+z^3-3xyz)$

6. (a) If $z=f(x,y)$, $x=e^u\cos v$, $y=e^u\sin v$, Show that 6

$$y\frac{\partial z}{\partial u}+x\frac{\partial z}{\partial v}=e^{2u}\frac{\partial z}{\partial y}$$

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(b) Find directional derivative of $\phi = xy^2+yz^3$ at point (2, -1, 1) towards the point (3, 1, 3) **6**

(c) Separate into real and imaginary parts of $\tan^{-1}(x+iy)$ **8**

7. (a) Find n, so that $v = r^n(3\cos^2\theta - 1)$ satisfy the equation **6**

$$\frac{\partial}{\partial r}\left(r^2\frac{\partial v}{\partial r}\right)+\frac{1}{\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\frac{\partial v}{\partial\theta}\right)=0.$$

(b) Find the extreme values of the function **6**
$x^3+3xy^2-15x^2-15y^2+72x$

(c) If $(a+ib)^p=m^{x+iy}$ prove that $\frac{y}{x}=\frac{2\tan^{-1}(b/a)}{\log(a^2+b^2)}$ **8**

F.E. (OLD) All Branches Sem. – I.

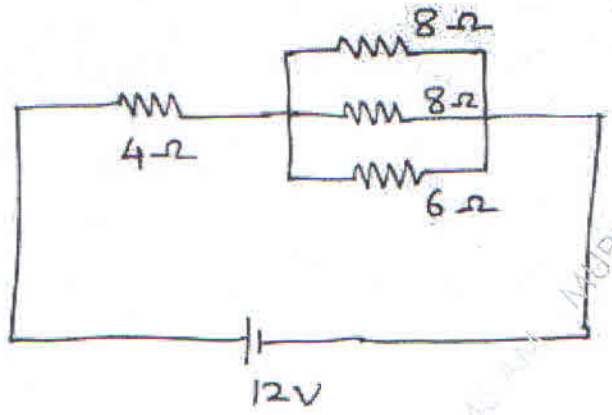
Basic Electrical Engineering – 20/12/2016

QP Code : 528305

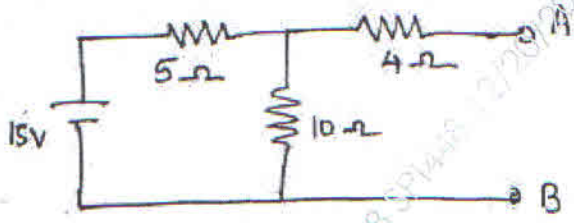
(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions out of remaining **six** questions.
(3) Assume any suitable data if necessary.

1. (a) Find the total current drawn from the source and power delivered to 4Ω resistance. **3**



(b) Find the Thevenin's equivalent ckt for the below circuit-as seen from A-B. **3**



(c) Define **2**
(i) form factor
(ii) crest factor of a waveform

(d) A resistance of 50Ω , inductance of 2 mH and capacitance of 0.5μF are connected in series across a 50V, variable frequency a.c. supply. At what frequency will the current be maximum? Find the amount of maximum current. Draw the corresponding phasor diagram. **3**

(e) Three resistances of 100Ω each are connected in star connection across a 3 phase, 400V, 50Hz a.c. supply. Calculate the current flowing through each resistance and total power consumption of the circuit. **2**

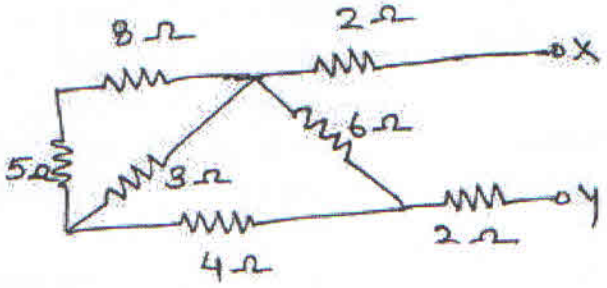
[TURN OVER

(f) Define 3
(i) efficiency
(ii) all day efficiency
(iii) voltage regulation of a transformer

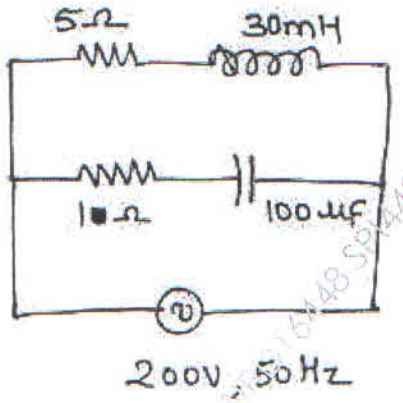
(g) Name the different types of d.c. generators and explain the difference in construction 2

(h) Draw the V-I characteristic of P.N. junction diode 2

2. (a) Find the resistance across x-y in the given circuit 6



(b) Find the branch currents, total current and overall power factor of the circuit. 6



(c) The open circuit test readings of a 110 KVA, 1100V/110V transformer are as follows o.c. test (on L.V. side) : 110V, 5A, 200W s.c. test (on H.V. side) : 92V, 10A, 250W. Calculate the equivalent circuit parameters refered to high voltage (H.V.) side. 8

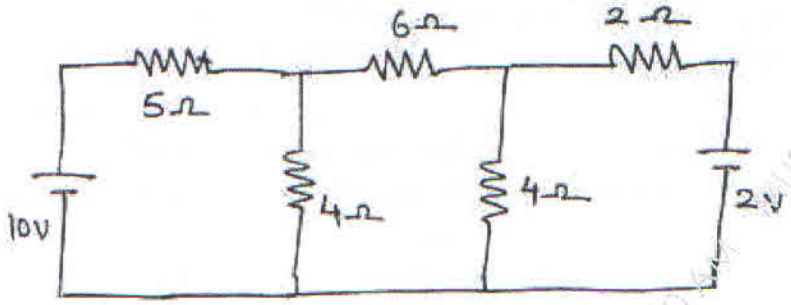
3. (a) Each phase of a delta connected load consists of 10 mH inductor connected in series with a 25Ω resistance. If the 3 phase supply voltage of 429V, 50Hz is applied to this load. Calculate 8
(i) phase current

(ii) line current
(iii) total power drawn
(iv) power factor of the circuit.
Draw the phase diagram

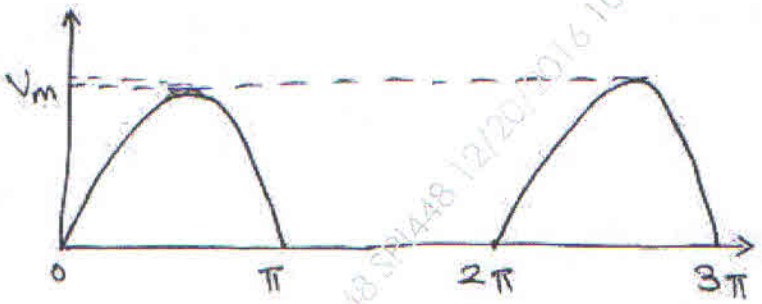
(b) Explain the working principle of transformer 4

(c) Explain the principle of operation of d.c. moter. Derive the equation for back emf 8

4. (a) Find the current flowing through 6Ω resistance by Mesh Analysis 7



(b) Find the rms and avarage value of the following waveform. Vm = 100V 4



(c) The two wattmeters connected to measure power in 3 phase circuit by 2 wattmeter method read 500 W and 800 W respectively. Find the total power consumption and power factor of the circuit. 4

(d) Draw a full wave center tapped rectifier circuit and explain the operation. Draw neat waveforms. 5

5. (a) Find the value of R_L so that maximum power is delivered to it. Also find the amount of maximum power 7

(b) What is meant by resonance in electric circuits. Compare resonance condition in series R-L-C ckt and parallel R-L-C ckt. 5

(c) A 50 KVA transformer has iron loss 600 W and full and copper loss 900 W. Calculate the 8

(i) Full load efficiency
(ii) load at which maximum efficiency is obtained
(iii) Maximum efficiency. Take power factor 0.85 lagging

6. (a) Find the current through 10Ω resistance by Applying Superposition Theorem. 7

(b) A current of 4 A flows through a pure resistance connected in series with a coil when supplying at 200V, 50Hz. If the voltage across the resistance is 100 V and that across the coil is 160V, calculate 7
(i) resistance & reactance of coil
(ii) power absorbed by the coil
(iii) Draw phaser diagram

(c) Draw the circuit showing the two wattmeter method for power measurement in three phase circuits. Discuss its advantages. 6

7. (a) Draw an impedance triagle for the given circuit. Cuttent through the circuit is 10 A. 2

(b) A sinusoidal current alternating at 10 Hz frequency has maximum value of 20 A. What will be its instantaneous value at t = 2 ms. At what instance will it have –20 A value? 3

(c) Explain the terms efficiency and voltage regulation of a transforer. Derive the condition for maximum efficiency. 5

(d) Explain why single phase induction motor is not self starting. Explain one method of making it self starting. 5

(e) Draw and explain the output characteristic of BJT in common emitter configuration. 5

F.E - All Br. (Old) .Sem I 27/12/16.
Applied Chemistry

QP Code : 528402

(2 Hours) **[Total Marks : 75**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Atomic weights – Al = 27, Ca = 40, S = 32, Cl = 35.5, Fe = 58.8, K = 39, H = 1, C = 12, N = 14, O = 16, Na = 23, Mg =24.

1. Solve any **five** :– **15**
   (a) Define BOD and COD with their significances?
   (b) What are the drawbacks of natural rubber?
   (c) Find the acid valu of used lubricating oil sample whose 20 ml required 10 ml of 0.5 N KOH during titration (density of oil = 0.80 g/cc) state whether the oil is suitable for lubrication or not?
   (d) Explain hydrogen as a fuel.
   (e) What is shape memory effect?
   (f) What is Gibb's phase rule?
   (g) Write the structural details of graphite.

2. (a) Calculate the amount of lime (90% pure) and soda (85 % pure) required to softening, 100,000 litres of water containing the following impurities. **6**
   $Mg(HCO_3)_2$ = 15.6 ppm, $MgSO_4$ = 16 ppm, $CaSO_4$ = 5.8 ppm, Na_2SO_4 = 20 ppm, $Ca(HCO_3)_2$ = 9.2 ppm, $MgCl_2$ = 40 ppm, SiO_2 = 12.5 ppm.
   (b) What is fabrication of plastic? Explain injection moulding in detail. **5**
   (c) Explain Flat plate Solar collector. **4**

3. (a) Give preparation, properties and uses of **6**
   (i) Buna S
   (ii) PMMA.
   (b) Explain extreme pressure lubrication method in detail. **5**
   (c) Write the application of nanomaterials in the field of electronics and mechanics. **4**

[TURN OVER

4. (a) What are solid lubricant? Explain it with two examples. **6**

(b) Write the application of Gibbs phase rule to one component system water. **5**

(c) The total hardness of 5,000 litres of water was completely removed by a zeolite softener. The zeolite softener required 50 litres of sodium chloride solution containing 20 gm/litre for regeneration. Calculate the hardness of water sample. **4**

5. (a) What are the specific effects of following elements on the properties of steel? **6**

(i) Chrominum
(ii) Nickel
(iii) Cobalt
(iv) Molybdenum
(v) Tungsten

(b) Write an activated sludge sludge method to control water pollution. **5**

(c) What is glass transition temperature? Write the effects of factors that affect it. **4**

6. (a) What are carban nanotubes? Explain laser method for production of carban nanotubes. **6**

(b) Explain with a neat diagram the zeolite process of water softening including the following points – **5**

(i) Principle
(ii) Process
(iii) Softening & regeneration reactions
(iv) Advantages and limitations

(c) Write a note on photovoltaic cell. **4**

7. (a) Write notes on – **6**

(i) Conducting polymers
(ii) Vulcanization

(b) Explain reactions of lime and soda used for softening of hard water. **5**

(c) What is reduced phase rule? Define – **4**

(i) Phase
(ii) Component
(iii) Degree of Freedom

F.E. (All Branches) (Old Course)
Applied Physics.

30/12/16.

QP Code: 528505

Duration: 2hrs | OLD Course | Max Marks: 75

Note:
1. Q.1 is compulsory.
2. Answer any FOUR from the Q. 2 to Q. 7.
3. Symbols have their usual meanings.
4. Assume suitable data wherever necessary.

Q.1		Attempt any FIVE of the following	
	(a)	Sketch (202), (123), [013].	[03]
	(b)	Define Lattice parameters.	[03]
	(c)	Explain the principle used to generate x-rays.	[03]
	(d)	Define Fermi level. Where it is located in case of Intrinsic semiconductor?	[03]
	(e)	Define mobility. Write the unit used to express it.	[03]
	(f)	Define piezoelectric effect.	[03]
	(g)	What is the difference between type-I and type-II superconductors?	[03]
Q.2	A	Derive the packing factor of Diamond cubic structure.	[08]
	B	Calculate the increase in the acoustic intensity level in dB when the sound is doubled.	[07]
Q.3	A	What is Hall effect? How do you find carrier concentration using Hall effect in semiconductors?	[08]
	B	Find the thickness of quartz plate needed to produce ultrasonic waves of frequency i) 3.8 MHz ii) 300 kHz. Given density =2650 kg/m^3 Young's modulus = 8 x 1010 N/m^2	[07]
Q.4	A	What are the conditions of good acoustics? Give some methods of design of good acoustics.	[08]
	B	Prove that electron takes parabolic path in perpendicular electric field.	[07]
Q.5	A	Explain the origin of characteristic X-ray spectrum.	[05]
	B	Explain briefly construction of CRT with schematic diagram	[05]
	C	Explain how phase difference between two wave is measured using CRO?	[05]
Q.6	A	Calculate the smallest glancing angle at which X-ray of 1.549A^0 will be reflected from crystal having spacing of 4.255A^0.	[05]
	B	Explain Meissner's effect.	[05]
	C	Calculate reverberation time for an empty assembly hall of size 20x15x10 cubic meter with absorption coefficient 0.106.	[05]
Q.7	A	Explain Bragg's law.	[05]
	B	What are the High Tc-superconductors ?	[05]
	C	Give classification of solids on the basis of band theory.	[05]
