THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Industrial Sociology (AME - 06, A-06 (R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer any five questions
Parts of a questions should be answered at one place

1.	a)	Define the terms : norms, Convention, and Customs.	4
	b)	Elucidate the socio-economic factors for relevance of these aspects.	16
2.		Discuss the basic features of Tribal and Agricultural society with a note of difference between the two.	20
3.	a)	What is 'Economic Development' ?	2
	b)	Analyse the socio-economic problems associated with economic development.	18
4.	a)	What do you mean by the term Technology Assessment ?	3
	b)	Discuss the positive and negative aspects of Technology Assessment.	17
5.	a)	What is meant by the term workers' adjustment ?	3
	b)	Explain the different aspects of workers' adjustment.	17
6.	a)	What is meant by the term 'Industrial Society' ?	2
	b)	Discuss in details the present features of Industrial Society in Indian polity.	18
7.	a)	Define the term 'Mobility'.	2
	b)	Explain the socio-economic factors for fast social mobility in Indian context.	18
8.		Explain the positive and negative factors of workers' participation in modern management.	20

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Electrical Engineering and Electronics
(AME - 08, A-08 (R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

PART - A
Parts of a questions should be answered at one place
Answer any 5 questions, each carrying 2 marks

1. a. State Thevenin's Theorem. 2x5=10
   b. Derive the equation of energy stored in a capacitor.
   c. Define apparent, real and reactive power.
   d. What do you mean by resonance in a R-L-C series circuit ?
   e) What is power factor ?
   f) What are different types of D.C. machines ?
   g) What are BJT and FET ?

Part - B

Answer any three questions

2. a. State and Prove superposition Theorem. 3+4
   b. Solve for the power delivered to the 10Ω resistor in the circuit shown in Fig.1. 8

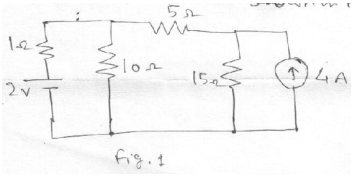


Fig. 1

3. a. State and explain maximum power transfer theorem. 3+4
   b. In the network shown in Fig.2. Find the value of R, such that maximum possible power will be transferred to R_L.
   Find also the value of maximum power drawn by R_L. 4+4

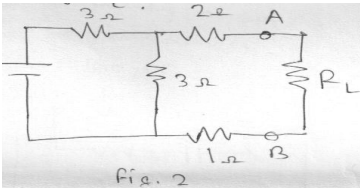


Fig. 2

4. a. Explain the comparison between electric and magnetic circuit. 7

b. Determine the hysteresis loss in an iron core weighing 50kg having a density of 7.8×10^3 kg/m^3 when the area of the hysteresis loop is 150 cm^2, frequency is 50 Hz and scales on x and Y axes are : 1 cm = 30 AT/cm and 1 cm = 0.2 cub/m^2 respectively. 8

5. a. Explain i)Average value ii) R.M.F. value iii) Form factor iv) Peak factor. 4x2

b. In the circuit given in Fig.3, if the value of $R = \sqrt{\frac{L}{C}}$ then prove that the impedance of the entire circuit is equal to r only and is independent of the frequency of supply. Find the value of inpedence for R = 0.02 H and C = 100 μf 4+3

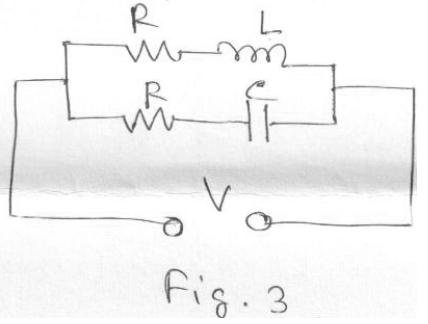


Fig. 3

6. a. What do you mean by 3 phase balanced system. 5

b, A balanced 3-phase supplies an unbalanced 3-phase delta connected load made up of two resistors 100Ω and 200Ω and a reactor having an inductance of 0.3 H with negligible resistance. V_L = 100v at 50 Hz. Calculate the total power of the system. 10

PART - C

Answer any three question

7. a. State the various parts of a transformer and their functions. 8

b. A 600 KVA, 1-phase transformer has an efficiency of 92%, both at full load and half load at unity power factor. Determine its efficiency at 60% of full load at 0.8 power factor lag. 7

8. a. Draw the equivalent circuit of different types of generator and motor. 8

   b. A long shunt D.C. compound generator delivers 110 KW at 200 V. If r_a=0.01Ω r_{se} = 0.00 2Ω and shunt field has a resistance of 110 Ω. Calculate the value of the induced e.m.f. 7

9. a. Explain why Ammeters are connected in series and voltmeters are connected in parallel. 5

   b. Explain different methods of starting of simple phase induction motor. 5

   c. Draw the connection diagram with wattmeter for measuring power across a load. 5

10. a. What are different types of semi conductors ? Give their properties. 5

    b. Explain with circuit diagram the application of P - N junction diode as rectifier. 5

    c. Explain the use of zener diode 5

11. Write short notes : (any three) 3x5

    a. Voltage doubler circuit
    b. LED
    c. Push-Pull inverter circuit
    d. Boolean functions
    e. Characteristics of Transistors.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Production Engineering (AME - 10, B-10 (R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any 5 questions

Parts of a questions should be answered at one place

1.	a)	Explain with neat sketches the process of Investment casting. State the advantages and limitations of the process.	8
	b)	Explain with sketches different furnaces used for melting metal during casting.	8
	c)	What are "risering aids"?	4
2.	a)	State and explain the different types of defects encountered while forging.	5
	b)	What do you mean by "Fullering impression" and "Blocking impression" ?	5
	c)	Differentiate between drop forging, press forging and machine forging.	5
	d)	Explain the process of Hydrostatic Extrusion.	5
3.	a)	Derive Merchent's solution from Merchant's circle diagram.	7
	b)	Explain the conditions fevourable for formation of different types of chips in machining.	3
	c)	What are the different modes of tool failure ? Explain with suitable sketches.	5
	d)	State the cause and effects of flank wear and crater wear.	5
4.	a)	Explain with next sketch the process of gear hobbing.	6
	b)	differentiate between accessories and attachments. Explain how taper turning is performed in a Lathe using an attachment.	6
	c)	Explain with Suitable sketches different centre type & centre less grinding operations.	8
5.	a)	State the desirable properties of a comparator. Also explain the principle of operation of comparators.	4
	b)	What are the different types of 'fits'. explain with suitable examples.	6
	c)	Make a neat sketch to show the difference between limits, tolerance and allowance for hole and shaft.	5

d) Write a short note on Interchangeable Manufacturing System. 5

6. a) Why surface treatment is done in manufacturing ? 4
   b) What is case hardening ? 4
   c) Differentiate between Cyaniding and nitriding. 4
   d) What is the difference between coating and cladding ? 4
   e) Explain the major features of PVD & CVD. 4

7. a) State the utility of Gantt chart. 5
   b) Differentiate between PERT & CPM. 4
   c) What do you mean by THERBLIG ? What would be the therbligs involved while picking up a glass of water ? 6
   d) Explain the inventory model with purchase discounts. 5

8. Write short notes on any four of the following. 4x5=20
   a) Radial Drilling Machine.
   b) EOQ
   c) Grating System
   d) Wire drawing
   e) Shell Moulding
   f) Broaching operation

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Material Science (AME - 09, B-09(R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer any 5 questions
Parts of a question should be answered at one place

1.	a.	Describe various types of point defects in crystals. Differentiate between screw and edge dislocations.	8 6
	b.	Explain Hume Rothery rules for formation of solid solutions.	6
	c.	Explain the role of dislocation in strain hardening.	
2.	a.	Explain various types of crystal structures	8
	b.	Determine that the atomic packing factor for BCC is 0.68.	6
	c.	Sketch within a cubic unit cell the following planes : a) (011); b) (112), c) (102), d) (131), e) (111), f) (122)	6
3		Write Short notes. a) Point defects b) Ionic bonds c) Surface Imperfections d) Elastic and plastic deformations	4x5
4.	a	Describe any binary phase diagram with suitable phase example.	6
	b.	Explain interstitial and substitution solid solutions by giving suitable examples	8
	c.	Describe eutectic, peritectic and eutectoid reactions.	6
5.	a.	Explain creep phenomena by drawing a creep curve.	6
	b.	differentiate between slip and twin phenomena.	6
	c.	describe recovery, recryattlization and grain grwoth of cold worked sample during annealing.	8
6.	a.	Why are ceramic materials generally brittle ?	6
	b.	What are refractories ? Discuss their engineering applications.	8
	c.	Explain Griffth's theory of fracture.	6

7.	a.	Make comparisons of thermoplastic and themosetting polymers on the basis of mechanical characteristics upon heating, and according to possible molecular structures.	8
	b)	Differentiate between additional polymerization and condensation polymerization.	6
	c)	Explain cross lin king and branching in polymers. Compare between vulcanization and aging of rubber.	6
8.	a)	What do you understand by silicon structure.	6
	b)	What are the benefits of composite materials ? Discuss their properties.	6
	c)	Differentiate between dispersion and particulate composites.	8

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Engineering Mathematics (AME-12,B-12(R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any five questions
Parts of a questions should be answered at one place

1. a. Solve by matrix method the system of equations

$$x+z = 0$$
$$3x+4y+5z = 2$$
$$2x+3y+4z = 1$$

10

b. If $A = \begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$ show that $A^2-2A+I_2 = 0$. Hence find A^{50}. 5+5=10

2. a. Test the convergence of the following series

a) $\frac{1+2}{2^3} + \frac{1+2+3}{3^3} + \frac{1+2+3+4}{4^3} + ...$

b) $\frac{1}{1.2^2} + \frac{1}{2.3^2} + \frac{1}{3.4^2} + ...$

10+10= 20

3. a. Verify the hypothesis and the conclusion of Mean value theorem for the function 10

$f(x) = x^3-3x+1$ on [1,3].

b. Prove that i) $B(m, n)) = B(n, m)$
ii) $\Gamma(n+1) = n\Gamma(n)$ 5+5=10

4. a. Find the Fourier series of the function f(x) with period 2π defined by 5+2+3 =10

$$f(x) = \begin{cases} -1, \text{ for } -\pi < x < 0 \\ 1, \text{ for } -0 \le x < \pi \end{cases}$$

Also obtain the sum of the series at
$x = \pm\pi$ and show that

$1- \frac{1}{3} + \frac{1}{5}$ to $\propto = \frac{\pi}{4}$

b) Find a series of sines which represents the function 10

$f(x) = \pi - x$ in $0 < x < \pi$.

5. a. Solve $\frac{dy}{dx} + 6y = 18\, e^{3x}$ 10+10=20

b. Solve by the method of variation of parameters

$\frac{d^2y}{dx^2} + y = \text{cosec } x$

6. a. Solve the wave equation $\frac{d^2u}{dt^2} = c^2 \frac{d^2u}{dx^2}$,

given that $u(o, t) = u(l,t) = 0$

$u(x, 0) = f(x)$ and $\frac{du}{dt}(x, 0) = 0$, where $0 < x < l$. 10

b. Obtain a solution of

$\frac{d^2u}{dx^2} + \frac{d^2u}{dy^2} = 0$

Subject to the boundary condition 10

i) $u = \text{siny}$ when $x = 0$, for all y

ii) $u \to 0$ when $x \to \infty$

7. a. Let $f(x, y) = \frac{xy}{x^2 + y^2}$, $(x, y) \neq (0,0)$ and 0 otherwise, 10

Evaluate $f_x(0, 0)$ and $f_y(0, 0)$.

b. If $x = r\cos\theta$, $y = r\sin\theta$. then show that 10

$\frac{\partial(r, \theta)}{\partial(x,y)} = \frac{1}{r}$

8. a. Find the extrema (i.e., maxima and minima) of the following function : 10

$f(x, y) = x^3 + y^3 - 3xy$

b. Evaluate $\iint_R (x^2+y^2)\, dxdy$, using the transformation $x^2 - y^2 = u$ and $xy = v$, 10

where R is bounced by $x^2 - y^2 = 1$.

$x^2 - y^2 = 9$, $xy = 2$, $xy = 4$

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding Metallurgy - I (AME - 13, B-16 (R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Attempt any Five Questions
Parts of a questions should be answered at one place

1. a) Explain the 3 major lattic structures formed in metals with neat sketches showing positions of atoms. Name 2 metals under each type of above 3 structures at room temperature. 5+3
   b) Mention the allotropic forms of iron with temperature of allotropic transformation and crystal structure occurs on heating. 4
   c) What is solid solution strengthening ? describe interstitial and substitutional solid solution with neat sketches showing placement of solute and solvent atoms. Name one alloy with (i) Interstitial & (ii) Substitutional solid solution mechanism. 2+4+2 =20

2. a) Draw neating the Fe-Fe_3C equilibrium diagram marking all important carbon percentages, temperatures and phases including peritectic, eutectic and eutectoid points. 8
   b) What is hypoeutectoid, eutectoid and hyper eutectoid steels : Out of those 3 types of steels which one should have (i) maximum ductility (ii) maximum hardness. Under which of the 3 types normal mild steel belongs ? 4+2+1
   c) Draw neatly the micro structure of an eutectoid steel. What is the expected hardness of such eutectoid steel at room temperature ? 4+1=20

3. Write short notes on (with compositions, micro structure and applications in industries) (Any 5) 4x5=20
   a) Medium Carbon Steel
   b) Cr-Mo Alloy Steel
   c) Nickel steel
   d) Micro Alloyed High Strength Steel
   e) High Maganese Steel
   f) Grey cast Iron
   g) 18-8 Stainless Steel

4. a) Draw a neat sketch of a carbon steel weldment done by SMAW process and show clearly different zones from weldmetal to basemetal structures of different zones. Explain the reasons of formation of such zones and variation in grain structures. 5+5

   b) What are the differences expected between a multipals and single pass fusion welded joint with respect to structures and properties. 5

   c) Explain the importance of preheating and interpass temperature in welding 5=20

5. a) Explain the T-T-T and C-C-T diagrams of an entectoid steel. What are the major differences between these two diagrams? 6+2

   b) What are the effects of (i) Grain size & (ii) Carbon content on T-T-T diagram ? 2

   c) Describe the following heat treatment procedures (any 4) 2.5x4=20
   i) Annealing ii) Stress Relieving iii) Quenching
   iv) Tempering v) Spherodising

6. a) Write on different approaches to define weldability. What are the factors which can affect weldability ? 5+5

   b) What is carbon equivalent and it's significance in welding? What are the precautions to be taken in case the carbon equivalent moves towards higher value ? 5+5

7. a) Draw the stress strain diagram of a mild steel and show the important points and zones in the diagram. 5

   b) Explain the mechanism of work hardening 5

   c) Describe the various stages of annealing of a cold worked metal with net sketches 5

   d) What do you undeerstand by peening of weld ? What are the advantages and disadvantages of peening ? 5

8. Write short notes on (any 5) 4x5=20

   a) Age hardening of Al-4% cu alloy
   b) Bianary phase diagram of Cu-Ni alloy system
   c) Problem in stress relieving of Cr-Mo-V lowalloy steel weldments.
   d) Martemperting
   e) cast structure and segregation
   f) L-D process of steel Making
   g) Desulphurisation in steel melting

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Heat and Mass Transfer (AME-14, B-14 (R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any Five questions
Parts of a questions should be answered at one place

1. a) With a neat diagram derive the three-dimentional transient heat conduction equation in cartesan coordinate. 10

   b) It is required to reduce the heat loss from a furnace wall by doubling the thickness of the insulating brick wall. Initially, the temperatures of the inner and outer surfaces of the insulating brick are 480°C and 180°, respectively. The atmospheric air is at 30°C. Calculate the percentage decrease in heat loss because of doubling the thickness of insulating brick wall. 10

2. a. Determine the expression of the rate of heat transfer through a rectangular fin of uniform cross section having insulated tip. 10

   b. An electrical heater uses 5m length and 2 mm diameter wire to dissipate 500 W in air at 30°C. the convective heat transfer coefficient between the wire surface and air in 20 W/m^{2}°C.

   i) Determine the temperature of the wire.

   ii) Determine the temperature of the wire if 3mm thick rubber (k =0/163 W/m2°C) insulation is used, assuming that the film coefficient between the rubber surface and air is also 20W/m^{2}°C.

   iii) Calculate the temperature of the wire if the thickness of rubber insulation equates the critical thickness of insulation. 10

3. a. What do you mean by lumped parameter analysis ?
   Find the temperature distribution of a body whose initial temperature is Ti, throughout and which is placed suddenly in a fluid at constant temperature Tα. The specific heat of the body is C, heat transfer coefficient at surface is h, p is the density and V is the volume of the solid, A is the surface area, k is the internal coefficient of conduction and t is the time. 3+7

b. A cylindrical carbon steel billet of 10 cm radius and 50 cm length, initially at 630°C, is suddenly dropped in a large quantity of oil at 30°C. The convective heat transfer coefficient between the oil and the steel billet is 50 W/m^2°C. Calculate the temperature of the billet

i) 200 s, and ii) One hour after it is dropped in the oil.

Given for carbon steel k = 40 W/m°C and $\alpha = 1.11 \times 10^{-5}$ m^2/s. 10

4. a. Derive the energy equation for a thermal boundary layer over a flat plate. 12

b. Mercury (ρ = 13,600 kg/m^3, $\upsilon = 0.114 \times 10^{-6}$ m^2/s, Cp = 0.1394 KJ/KgK; K = 8.7 W/m°C) at 25°C is flowing through a tube of 2 cm diameter with Raynolds number = $(10)^4$. Calculate the convective heat transfer coefficient.

Given : $Nu_D = 0.0395\ Re_D^{0.75}\ Pr^{0.33}$. 8

5. a. With the help of dimensional analysis show that in case of free convection the Nusselt number is a function of the Grashof number and the Prandtl number. 12

b. A large vertical plate of 5m height is maintained at 100°C and exposed to air at 30°C. Find the convective heat transfer coefficient.

At film temperature 65°C air properties are :

k = 1.029 w/m^2; Pr = 0.7; $\upsilon = 19.44 \times 10^{-6}$ m^2/s; $\beta = {}_1/T_f = {}^1/_{338}$.

Given : $Nuf = 0.021\ (Gr_f\ Pr_f)^{0.4}$. 8

6. a. With a neat diagram derive an expression of logarithmic mean temperature difference for a parallel flow heat exchanger. 10

b. It is desired to cool 0.5 kg/s of oil from 105°C to 45°C by using an equal flow rate of cooling water. The cooling water is available at 20°C. The specific heats of oil and water are 2.8 KJ/kgK and 4.2 KJ/kgK. Two double pipe heat exchangers are available : 10

Heat exchanger 1 : $U = 500\ W/m_2K$; $A = 4.5\ m^2$

Heat exchanger 2 : $U = 800\ W/m^2K$; $A = 2\ m^2$

Which heat exchanger should be used ?

7. a. Briefly explain Kirchoff's law of radiation. 4

b. An infinitely long cylinder of radious r_1 is enclosed by another infinitely long cylinder of radius r_2. Determine the radiation shape factors F_{21} and F_{22}. 6

c. Show that the total emissive power of a diffuse surface is Π times its intensity of radiation. 10

8. Write short notes on (any four) 5x4

a. Wien's displacement law

b. Different types of boundary conditions

c. Area weighted fin efficiency

d. Fourier's law of heat condution

e. Number of transfer Units.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Engineering Economics (AME -16,C-17(R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer question No.1 (Compulsory) and any Four question from the rest
Parts of a questions should be answered at one place

1. Point out wether the following statements are true or false : (any ten) 2x10
   a) Desire and demand are two different things .....
   b) Extension and contraction of demand is related to change in price .....
   c) Tea and Coffee are not substitutes .....
   d) Effective demand forecasting can be made through past experience .....
   e) Demand forecasting is important for competitive strategy .....
   f) Effective demand forecasting results in loss of revenue .....
   g) Output is an independent variable .....
   h) Technical Economics are part of internal economics .....
   i) In a long term period cost curve is U - shaped.....
   j) Average cost is equal to AFC + AVC .....
   k) All cost is paid in terms of money are explicit cost .....
   l) Market price and Normal price are same .....
   m) Petrol pumps are examples of monopoly .....
   n) Sales Book has always credit balance .....
   o) Return Inward Book has always Credit balance.....

2. a) What is Cross Elasticity of Demand ? Describe various types of Cross Elasticity of Demand with some examples. 10

   b) On the basis of following information given in the table compute the Price Elasticity of demand when price rises from Rs.5 per kg to Rs. 7 per kg. 10

Price per kg (Rs.)	Expenditure (Rs.)
Rs.5.00	Rs.15,000
Rs.7.00	Rs.7,000
Rs.8.00	Rs.0
Rs.4.00	Rs.16,000

3. a) What is difference between Normal goods and inferior goods? How will the demand for goods changes if price of substitute falls. 10

   b) Distinguish between Contraction in Demand and Decrease in Demand. 10

4. a) Describe the importance of Demand Forecasting for Business Enterprises. 10

   b) How will you show Demand forecasting in case of new products ? 10

5. a) What is Opportunity Cost ? Gives some examples of Opportunity Cost. How are these Costs relevant for managerial decisions ? 10

   b) Describe Break-even point with the help of diagram and its uses in business decision making. 10

6. a) What factors are to be considered before fixing price ? Explain the price in strategy. 10

   b) What do you mean by process of Book keeping ? What are the objectives of Accounting ? 10

7. a) Define the features of Money Market. Distinguish between Capital Market and Money Market. 10

   b) What is Working Capital ? What factors are to be considered while estimating Working Capital ? 10

8. a) Managerial Economy is a multi dimensional discipline. Explain. 10

   b) Discuss the scope of Managerial Economy 10

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Computational Methods & Computer Programming (AME - 17, C-18(R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer question 1 (compulsory) and any Five from the rest
Parts of a questions should be answered at one place

1. Answer all questions 6x5=30
   a) What is a function ? Write the advantages of using functions. What is the purpose of the return statement ?
   b) What is an array ? What condition must be satisfied by the all elements of any given array ?
   c) What are the differences between compiler and interpreter. Give examples.
   d) What is BCD and EBCD ? Write the differences.
   e) Briefly discuss about the I/O devices of a personal computer.
   f) Write the differences between WINDOWS and UNIX.

2. a) Briefly describe the functions of different components of a conventional digital computer with a suitable block diagram. 10
   b) What is an operating system ? Give example. 4

3. a) Differentiate between while and do while statements with suitable example. 7
   b) Wrete a C program to check whether a given number is prime or not. 7

4. a) Convert the following 3x3=9
      i) $(3AC)_{16}$ to decimal
      ii) $(100\ 1011)_2$ to Hexadecimal
      iii) $(52)_{10}$ to binary
   b) Differentiate between NAND and NOR gates 5

5. a) Write a C program for adding, substracting, multiplying and dividing two large decimal numbers. 7
   b) Write C program for adding two matrices using array manipulation. 7

6. a) What is a pointer ? How does if differ from array ? How is an array defined within a structure ? 8

   b) Write C code for finding the value of the following series taking n as input. 6

   $1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots\ldots + n^2$

7. a) What are auto, extern and static variables ? Explain their uses with suitable examples. 6

   b) Write a C program to check where a particular letter exists or not. 6

   c) What is break statement ? 2

8. a) Write a function power (a, b) that can calculate a^b for any floating a and positive integer b. 7

   b) Write a C program to find the length of a string without using "strlen ()". 7

9. Short note Answer for any four from the following : 14

   a) Bitwise operation

   b) Union in C

   c) XOR gate

   d) ASCII

   e) DOS

   f) Preprocessor in C.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding Equipment and Consumables (AME - 23)

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any Five questions choosing at least two (02) questions each from Group A and B.

Parts of a questions should be answered at one place

Group A : Welding Equipment

1. Write shorts notes to explain any two of following Welding processes essentially covering :
   a) What is the unique feature of the process **?** (2+2=4)
   b) Sketches / Block diagram of the essential parts of the set up required for welding 5+5=10
   c) Brief Cost - Benefit analysis & Field of Applications 3+3=6
   i) Gas Metal Arc Welding
   ii) Manual Metal Arc Welding
   iii) Gas Tangsteen Arc welding

2. Explain with sketches (Where required) :
   a) Principles of operation of submerged Arc Welding 5
   b) Equipment and accessories required for Submerged Arc Welding process. Why this process is mostly used in heavy industries ? 10
   Name the base metals on which submerged Arc welding is mostly done ?
   c) What are the industrial applications of submerged Arc Welding process? 5

3. a) What are the basis principles of plasma cutting ? 5
   b) At what temperatures plasma arcs typically operate ? 2
   c) Name the materials that can be cut by plasma cutting. 3
   d) Describe the safety hazards of Plasma Arc Cutting 2
   e) Describe the uses of Plasma Arc Cutting. 5
   f) For protection of ears from deafening noice during PAC what device is used ? 3

4. Write short notes with sketches where required on any four. 4X5=20
   a) The Tubular wires used in FCAW process
   b) Describe the metal transfer that occurs during GMAW process with sketches.

c) Draw and describe the butt and fillet joints prepared for welding of plates stating the position of welding as per Indian Standards (IS)

d) What is 'Flashback' in gas cutting ? How this phenomenon can be prevented ?

e) Describe Volt-Ampere characteristics for a MIG (GMAW) power source with a neat sketch

f) How does hydrogen gas diffuse in a weld joint ? During MMAW Welding process how you can prevent it ?

Group B : Welding Consumables

5. Write short notes on **(Any four) :** 4X5=20

a) Describe different types of submerged Arc Welding fluxes and their classifications.

b) What is our inert gas and how it differs from an Active Gas ?

c) Describe the brazing filler metal used in Torch Brazing.

d) Name the shielding gases used in GTAW process and state their properties.

e) What is plasma state of matter ?

f) Mention different types of stainless steel materials being used in industry. Which of them is most weldable ?

6. a) Name the hardfacing alloys being used in industries. 5

b) What are cellulosic coated electrodes in MMAW process ? Give AWS classifications these electrodes 5

c) Mention where the cellulosic coated electrode is mostly used. 5

d) What is cladding ? Where they are used ? 5

7. a) For welding of a pressure vessel having plate thickness 20mm and carbon Equivalent = 0.4% which type of weld joint you would prefer to prepare ? 5

b) Which of the welding process you will choose to carry out circumferential welding of the vessel ? 5

c) Before starting welding what steps you will choose ? 5

d) After completion of welding what preventive st4eps you will take so that finished weld does not crack ? 5

8. Decode in details as per AWS code of following classifications indicating type of consumables (e.g., electrode, wire flux combination etc) and intended application areas. (Any Four) : 4x5=20

a) E7028 b) ER209 c) ECuSn-A

d) ER4010 e) EL-8 f) ER70S-6

g) E6010

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Weldment Design and Weld Procedure
(AME - 18, C-23 (R))

Full Marks : 100

Pass Marks : 40

Time : 3 Hours

Parts of a questions should be answered at one place

1. a) State the basic objectives of a weldment design. 6+8+6
   b) State and explain with examples from design point of view the different types of loading and different types of conditions a weldment may be subjected to.
   c) What are the major physical properties of material a designer must consider for such loadings and conditions ?

2. Consider the two assemblies shown in Figures 1 and 2.
   Fig.1 Lap joint with fillet welds loaded in parallel. Fig.2 Lap joint with fillet welds loaded perpendicularly.
   Compute the weld sizes using an E70 electrodes (E48), and with L = 4 (100 mm) needed to resist the applied load of 40 kips (180 kN)?

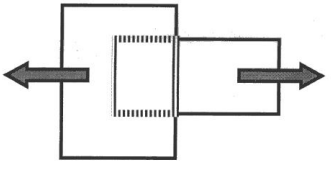


Fig. 1

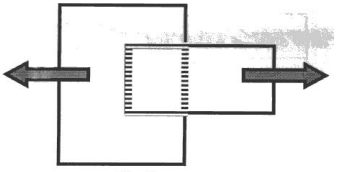
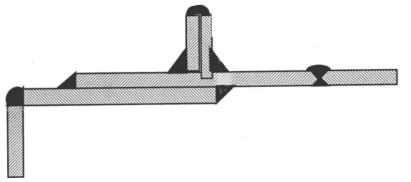


Fig. 2

3. a) Define and distinguish between the following as applicable to structural design
      a) Notch stress and hot-spot stress
      b) Axial strain and shear strain. 10
   b) Draw Stress strain diagram to explain :
      a) Fatigue Strength
      b) Endurance
      c) Creep Strength 10

4. a) Name the joints shown in the diagram below. b) Draw details of each joint to show the sizes in terms of leg. throat invexity, concavity and the standard limits for structural design. c) Explain with sketches what may be the deviations to cause joint failures and why. 4_8+8



5. Fill up the Blanks in the Codification Table below : 2x10=20

ASME BPVC Section V	
	Specification for welding Procedure and Performance Qualification
API RP 577	
	Specification for welding of steel pipelines on land and offshore - Part 1 : Carbon and carbon manganese steel pipelines
PD 6705-2	
	Quality requirements for fusion welding of metallic materials, five parts.
EN 1011-5	
DIN 1910-100	
	Code if practice for training and testing of metal
IS 822 : 1970	

6. A. Draw neat sketches to show the following welded joints with appropriate symbols : 5x2
   a) A 10 mm square Butt Joint.
   b) A 20 mm double V joint.
   c) A 40 mm double bevel Butt joint with Flush Weld.
   d) A 10 mm T joint with Convex Fillet welds on both sides.
   e) A 12 mm Lap joint with concave fillet weld.

   B. Draw a neat sketch to show : 5x2
   a) Joint root, b) Groove face, c) Root face. d) Root Edge, e) Root opening. f) Bevel, g) Bevel angle, h) Groove angle. I) Groove radius

7. a) State and explain different non-destructive tests generally used and their specific applications. 8

   b) For Visual examination state the inspections to be carried out before, during and after welding. 8

   c) What is FEMA ? How can it be applied in welding ? 4

8. Write short notes on (Any Four) : 4x5=20

   a) Welding Distortion and its effect on structural fabrication.

   b) Use of Mohr's Circle in designing welds.

   c) Types of weld fractures, their causes and remedial measures.

   d) Residual stress and distortion.

   e) Fitness for purpose.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding Metallurgy - II (AME - 20, C-20(R))

Full Marks : 100

Pass Marks : 40

Time : 3 Hours

Answer any five questions
Figures in the margin indicate marks
Parts of a question should be answered at one place

1.	a)	How do you weld ductile iron avoiding embrittlement of the HAZ ?	10+10
	b)	How does gas absorption in the weld pool occur during fusion welding of ferrous alloys ? How can you preventing gas absorption during manual metal arc welding of steels?	
2	a)	Draw the Schaffler diagram. What are the important modifications of this diagram ?	15+5
	b)	Why is it necessary to retain a small volume fraction of ferrite in 304 stainless steel for good weldability ?	
3	a)	Explain the mechanisms of cold cracking and hot cracking of welded steel joints.	10+10
	b)	What is the principal cause of lamellar tearing ? How does it occur ?	
4.	a)	What are the sources of residual stress in weldments ?	8+12
	b)	How can you minimise residual stress generation by (i) modifying design (ii) post weld heat treatment.	
5.	a)	What is weld decay in austenitic stainless steel ? How can you prevent it ?	10+10
	b)	What do you meany by knife edge attack ? How does it occur ?	
6.	a)	Write a brief note on ceramic-metal joints.	10+10
	b)	How is the microstructure of the mating surface affected in friction welding ? How does bonding take place during friction welding ?	

7. Discuss the principles and procedures for the following types of weld tests : 8+6+6
   a) Bend tests
   b) Ultrasonic test
   c) Radiography

8. Write short notes (any Three of the following) : 20
   a) Polarisation and passivity
   b) Liquation cracking
   c) Cladding
   d) Hardfacing alloys
   e) Choice of electrodes for boiler grade steels and cryogenic vessels.
   f) Importance of preheating and post weld heat treatments.
   g) Defects in MMAW welds.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Physics (AME - 02, A-02 (R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer any ten questions
Parts of a question should be answered at one place

1. A vibrator of mass 10 gm is acted upon by restoring force 10^7 dyne/cm, a retarding force 4 x 10^3 dyne/cm/sec and driving force $10^5 \cos(\omega t)$
   a) Write down the equation of motion. 2
   b) Find the resonant frequency. Determine the maximum amplitude of vibration and the maximum kinetic energy. 2+2+2
   c) Also determine the quality factor. 2

2. a) Define reverberation. How can it be controlled in an auditorium? 2+2
   b) Write down Sabine's formulae and Give its theoretical explanation. 2+2
   c) What is the intensity of a 60dB sound? (The standard intensity is $I_0=10^{-12} W/m^2$) 2

3. a) Write down the criterion for sustained interference. If the two interfering waves have intensity ratio I_1/I_2= 1/20 and have phase difference δ = 30° between them find the ratio of minimum to maximum intensity of the resultant wave. 2+3
   b) Draw the experimental set up to determine wave length of monochromatic light by Newton's ring method and find its expression when viewed through reflected light. 2+3

4. a) Write down the conditions for Fraunhofer's diffraction. How can it be created in laboratory? 2+2
   b) Determine the angular width of central maxima in the diffraction pattern of a single slit of width equal to 10 times the wavelength of monochromatic light used. 3
   c) State and explain Rayleigh's criterion of resolution. 3

5. a) What do you understand by polarization of light ? state different methods to produce polarized light. 2+2
   b) Identify the state of polarization of the following waves.

(i) $E_x = E_0\cos(\omega t + kz)$; $E_y = E_0\cos(\omega t + kz)$

(ii) $E_x = E_0\cos(\omega t + kz)$; $E_y = E_0\cos(\omega t + kz + \pi/2)$

(iii) $E_x = E_0\cos(\omega t + kz)$; $E_y = E_0\cos(\omega t + kz - \pi/2)$ 3

c) The optic axis of two polarizers are at an angle of 45° with each other, What will be the intensity of the emergent light compared to the incident unpolarized light on the first polarizer? Also state the angle of polarization. 3

6. a) What do you understand by population inversion? How does it achieved in Ruby laser? Draw the band energy diagram to explain laser emission in Ruby laser. 2+2+2

b) Define numerical aperture of optical fiber. In a step index fiber refractive index of core is 1.65 and that of cladding is 1.55, determine numerical aperture. 2+2

7. a) Show diagrammatically what kind of change in shape of image will be observed in presence of Coma. What measures will you take to reduce this defect? 2+2

b) State the reason for chromatic aberration. How can it be minimized by using two thin lenses? 2+4

8. a) A light of frequency 5×10^{14} Hz enters glass from air and its velocity becomes 0.64C, determine the refractive index of glass? Also calculate wavelength of light in air and in glass. ($C=3 \times 10^8$m/sec, velocity of light in vacuum of air) 2+3

b) How much phase change will be suffered by the above light as it passes through 100nm of the glass? 2

c) Explain the phenomena of double refraction citing example. 3

9. a) Calculate self inductance of a coil of 1000 turns when 2.5A current through it produces magnetic flux of 0.5Wb-m. How much magnetic energy will be stored in it? 2+2

b) What is mean by non-inductive coil and where is it used? 2+1

c) Write down an expression for magnetic flux due to a solenoid of length l, cross section A and have N turns, when I current is passing through it. How can the amount of magnetic flux of the solenoid be increased? 2+1

10. a) State Bio-Savart's Law and use it to find an expression for magnetic field at a distance r from a long straight wire. 2+4

b) Two straight wires are kept 2m apart in air and are carrying currents 8A and 3A in same direction. Calculate the force between them. Will it be repulsive or attractive? 3+1

11. a) What do you understand by 220V, 50Hz ac supply to your house? What is the advantage of supplying ac over dc? 2+2

b) What is the reactive power and how does it affect real power in an ac circuit? In this context define power factor. 2+2+2

12. a) Draw the phasor diagram and calculate impedance of a series L-C-R circuit of L=40mH, C=20μF and R=500Ω. Also determine the power factor of the circuit. 2+2+2

b) For the household ac supply of 220V, 50Hz draw the power triangle of the above circuit. 4

13. a) Show that motion of a pendulum is simple harmonic. 3

b) If the length of the pendulum is 10cm find its frequency of oscillation. (Assume acceleration due to gravity g=9.8m/sec^2) Also calculate the amplitude and the maximum kinetic energy if the pendulam of 10gm oscillates through the maximum angle of 4° . 2+2+3

14. Write short notes on : - 5+5

a) Laser and its application b) Ultrasonic and its application

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding and Allied Processes II (AME - C-22(R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer any five questions
Parts of a question should be answered at one place

1.	a)	Explain the differences between GTAW and GMAW on the basis of process, parameters, equipments and applications.	8
	b)	What is arc blow ? Briefly state the causes of arc blow and how it can be minimized.	7
	c)	Explain the term "coating factor"	5
2.	a)	What is resistance welding ?	4
	b)	Differentiate between "Spot Welding" and "Seam Welding" with neat sketches.	6
	c)	Why resistance spot welding of galvanized steel sheets are difficult in comparison to the same for uncoated steel sheets?	6
	d)	Explain projection welding process with a suitable sketch.	4
3.	a)	Explain the mechanism of arc initiation and maintenance.	5
	b)	Describe the structure of an electric arc.	5
	c)	What is arc length ? State the advantages of long and short arcs.	5
	d)	State any two weld defects along with their causes and remedies.	5
4.	a)	Describe the procedure of gas welding.	5
	b)	Explain how different types of flames can be identified in gas welding.	5
	c)	State different types of joints in welding.	5
	d)	What do you mean by welding position ?	5
5.	a)	Differentiate between Friction welding and Friction stir welding processes.	5
	b)	State the primary source of energy in Alumino thermit welding process.	5
	c)	Make a comparative study between submerged Arc welding and electro slag welding processes.	5
	d)	What is Forge Welding ? State it's limitation.	5

6. a) Explain the principles, processes and applications of Laser Beam welding and Electron Blam welding. 10

   b) State the advantages of plasma arc cutting over oxy-fuel cutting. What are plasmetrons? 6

   c) State the limitations of LBW, EBW and PAW. 4

7. a) Differentiate between brazing and braze welding. 6

   b) What are the different techniques used for soldering and brazing ? 9

   c) What are the different consumables and fluxes used for brazing and soldering ? 5

8. Write short notes on any four of the following : 4x5=20

   a) Electron beam drilling

   b) Cladding techniques

   c) Spraying materials

   d) Difference between flame spraying and arc spraying.

   e) Stud welding

   f) Differences between mechanization, automation and robotisation in welding.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Elementary Mathematics (AME - 01, A-(01)R)

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any ten questions
Parts of a question should be answered at one place

1. a) Show by vector methods that the medians of a triangle meet in a point that trisects them 10

   b) If $\overline{A} + \overline{B} + \overline{C} = \overline{0}$, prove that
   $\overline{a} \times \overline{b} = \overline{b} \times \overline{c} = \overline{c} \times \overline{a}$ 5

   c) Give a geometric interpretation of the result in (b). 5

2. a) If $s = (a+b+c)/2$, prove that 10
   $$\begin{vmatrix} a^2 & (s-a)^2 & (s-a)^2 \\ (s-b)^2 & b^2 & (s-b)^2 \\ (s-c)^2 & (s-c)^2 & c^2 \end{vmatrix} = 2s^2 (s-a)(s-b)(s-c)$$

   b) Solve by Cramer's rule 10
   $$\frac{1}{x} + \frac{2}{y} + \frac{1}{z} = \frac{1}{2}$$
   $$\frac{4}{x} + \frac{2}{y} - \frac{3}{z} = \frac{2}{3}$$
   $$\frac{3}{x} - \frac{4}{y} + \frac{4}{z} = \frac{1}{3}$$

3. a) If $\ln(y + \sqrt{y^2+1}) = x$, express y as a function of x. 10

   b) Find all the values of $(1+i)^{1/3}$, and obtain their product. 10

4. a) If $f(x) = \tan x$, verify whither Rolle's theorem is applicable to f(x) in the interval $[0, \pi]$. 10

   b) Find the derivative of the function 10
   $$y = \tanh^{-1}\left[\frac{x^2-1}{x^2+1}\right]$$

5. a) Using mean value theolem prove that 10
   $$\frac{x-1}{x} < \log_e x < (x-1)$$

   b) Using Taylor's theolem, show that 10
   $$\ln x = (x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} -$$

6. a) Prove that 3

$$\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$$

b) Using the above property, show that 7

$$\int_0^{\Pi 2} \log \tan x\,dx = 0$$

c) Evaluate $\int e^{2x} \sin 3x\,dx$ 10

7. a) Find the area enclosed by the two curves $y=x^2$ and $y^2=x$ in the first quadrant. 10

b) Find the length of the arc of the curve $y^2 = 4x$ from (0,0) to (1,2). 10

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Strength of Materials (AME - 07, A-07 (R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any five questions.
Parts of a questions should be answered at one place
Figures in the right hand margin indicate marks

1. a) Define shear stress and strain in a body under specified loading. 4

   b) Derive the expression for shear strain energy. 4

   c) A steel rod of 20.5mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 45.5°C, find the nature of stresses developed in copper and steel. Take E for steel and copper as 201Gpa and 110Gpa and α for steel and copper as 12.5 x 10^{-6} / °C, 17.5 x 10^{-6}/°C 12

2. a) Draw stress-strain diagram showing salient points on it for a mild steel and torr steel specimen tested in laboratory. 5

   b) Set up the relationship among elastic constants: modulus of elasticity, Poissoin ratio and modulus of rigidity for a given material. 5

   c) A rectangular bar made of steel is 3.5m long and 10.2mm thick. The rod is subjected to an axial tensile load of 74.5kN. The width of the rod varies from 65mm at one end to 28.5mm at the other. Find the deformation of the steel rod. Also derive the necessary formula used. Assume E = 205Gpa. 10

3. a) Define Mohr's circle for stress. Mention the related mathematical relation for it. 5

   b) Explain the condition for Mohr's circle with zero radius with the help of example. 5

   c) At a point in a strained material, the principal stresses are 10MPa tensile and 15MPa compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 40° to the axis of the major principal stress. What is the maximum intensity of shear stress in the material at the point ? 10

4. a) Derive bending stress formula for beam. Use standard symbols in deriving the formula. 5

   b) Derive the expression for section moduli for standard rectangular and triangular sections. 5

   c) A cast iron beam 25mm x 50mm in section and 150cm long is simply supported at the ends. It carries a point load W at the centre. The maximum stress induced is 110MPa. What uniformly distributed load will break a cantilever beam of the same material 40mm wide, 110mm deep and 2.5m long? 10

5. a) Define Shearing Force Diagram (SFD) and Bending Movement Diagram (BMD). Explain their importance. 5

   b) A simply supported over-hanged beam of 6.5m is subjected to *udl of* intensity 5.5kN/m over its entire length. The beam has equal overhang of 1.25m on each side with a concentrated load P for at two end points. If the simply supported span is 4m calculate the value of P for which moment over each support equals the moment at mid span. Also draw SFD and BMD for the beam showing important values on it. Does the beam has any point(s) of contra flexure? If so, mention. 15

6. a) State and explain moment area theorems for the estimation for slope and deflection in beams. 5

   b) A simply supported beam of span L is subjected to linearly varying load with intensity zero at free end and maximum *w* at fixed end. If the beam has uniform flexural rigidity, find maximum deflection and slope of the beam at mid span. 10

   c) A cantilever neam of span 3.5m is subjected vto a uniformly distributed load 10kN/m throughout its span. Design the beam cross section as rectangular when the permissible flexural stress for the beam material is 12.00MPa. Assume the width to depth ratio of the beam cross section as 1:2.5. 5

7. a) Derive the expression for torsional stress formula for a circular shaft. 5

   b) A thin cylinder of bronze 210mm internal diameter has a thickness of 3.5mm. It has its ends closed and filled with water. On the application of an external pull of 85kN at its ends, it was found that water pressure decreased by 0.12MPa. Calculate the value of Poisson's ratio. Take E = 122GPa and K = 2.5GPa. 7

   c) Write short notes on the following : i)shear centre, ii)shear modulus, iii)modulus of rupture, iv) Yield stress 8

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Testing and Quality Assurance (AME - 19, C-19(R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any Five questions. All questions carry equal marks
Parts of a questions should be answered at one place

1. a) What is the importance of hardness as a mechanical property? Describe the Rockwell hardness test. 10
   b) What is toughness and how is it measured? Explain with sketch any one test used for measuring toughness. Also show with sketch the various features of the specimen used for test. 10
2. a) What is S-N diagram? Where is it used? 10
   b) Explain the stress-rupture test and its use. Which material property is tested using this test? Explain the nature of results obtained from this test. 10
3. a) Explain the principle of X-ray radiography.
   b) For inspection of which type of welded objects is X-ray radiography more suitable? Explain. 5
   c) What are types of objects for inspection of which the magnetic particle testing is more suitable? 5
4. a) Explain the principle of (i)Ultrasonic inspection (ii) Acoustic emission testing. 10
   b) Explain with sketch the working of an angle probe and show how it is used for testing various types of weld defects. 10
5. a) What is meant by inspection by attributes and inspection by variables? 8
   b) Explain the concept of control chart in terms of percent defective in case of continuous production. Can we get inference from it about the process going out of control before it really happens? How? 12
6. a) What is meant by probability of detection (POD) in the context of NDT? Explain clearly various factors affecting it. 8
   b) What is an acceptance-sampling plan? 4
   c) Explain the operating characteristics (OC) curve in the context of acceptance-sampling plan. 8
7. Explain the various types of tests carried out on sample produced for procedure qualification. What are the final conclusions, which we derive from these in terms of weld quality? 20

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Engineering Drawing (AME - 11, B-11(R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer all questions
Parts of a questions should be answered at one place

1. Construct a parabola whose distance of the focus from the directrix is 50mm 15

OR

Construct a rectangular hyperbola whose distance of the focus from the directrix is 65mm and the eccentricity is 3/2. 15

2. Draw the involute of a circle of diameter 15 mm. 15

OR

A circle of 50 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference for one complete revolution of the circle. Name the curve. 15

3. The length of the top view of a line parallel to the V.P. and inclined at 45° to the H.P. is 50 mm. One end of the line is 12 mm above the H.P. and 25 mm in front of the V.P. Draw the projevtion of the line and determine its true length. 15

4. Show, in free hand, any three of the following welding joints and their welding symbol in any standard notation. 3x5=15

   a) T - joint with fillet welds on both sides.

   b) Double V bevel groove butt joint.

   c) Double J groove butt joint.

   d) single V bevel groove butt joint with multiple passes.

5. Draw the plan, elevation and side view of the object in Fig.1 reviewed in the direction of arrow 'X' 40

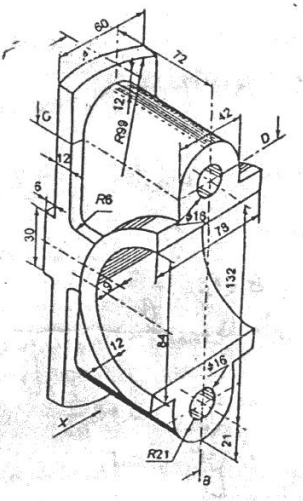


Fig –1

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : General English (AME-4, A-04 (R))

Full Marks : 100

Pass Marks : 40

Time : 3 Hours

Answer all questions
Parts of any question should be answered at one place

1. Write an essay in about 300 words on any one of the following topics : - 20
   a. Technology and its effects on human health.
   b. Rural uplift programme of India.
   c. Global terrorism - the fight against terrorism.

2. Read the following passage and answer any five of the following questions given below 20

Three types of chemicals are found in the daily food we eat. Most of them are naturally present. They are the first type. The second type are contaminants that find their way into the food by accident, such are various bacteria. The third are chemicals that are purposely added to food either as preservatives, or to enhance its appeal, such as flavour, colour, or nutritional value. In other words, these added chemicals or food additives make the food more marketable.

Chemical additives that achieve a cosmetic effect are the most widely used in food industry. They are also the additives that are causing the gravest concern. These cosmetic additives are introduced into food to make them more attractive to look at, thereby increasing their marketability. They have little or no nutritional value. Many of them are found to be harmful. It is well known that colour and flovour are an important factor for the food we buy. We are reluctant to eat food that looks drab and flat without any characteristic flovour or appetising aroma. The cosmetic modifiers are meant to fool our taste. On top of this, there is the subconcious feeling that whatever looks, smells and tastes nice must be good for health. Artificial colourings increases the attractiveness of food products. The importance of colouring is judged by studies which show that

with the same flavour in soft drinks people report stronger flavour with deeper colourings. Tartartime or sunset yellow has no food value but increases the attractiveness of the food.

Perhaps the only additives of any value to the consumer are those that proclaim in the nutritional value of processed food. These are various vitamins and mineral suppliments that ' enrich' our diet.

It is just another method to put back what has been lost during processing whether they are needed or not is another question. What matters most is that both parties are happy. The food industry with their profits and the ' health concious' consumer who thinks his day is wasted without talking a cup of that energy giving fluid advertised as health drink.

a. What is the topic the passage deals with? How many types of chemicals are found in our daily food?
b. Describe each type of chemicals in our daily food?
c) What is meant by 'cosmetic' effect? What does it do to food stuff?
d) What importance of colouring has been discovered by studies?
e) What are the only valuable additives used in food items for sale?
f) "What matters is that both parties are happy" What do you understand by this expression?

3. Make a Precis of the passage given above in about one third of its length and suggest a suitable title for it. Use your own language as far as possible. 15

4. Write a report on any one of the following topics in about 200 words. 20
   a. As a recruiting officer of a car manufacturing firm, you have been asked by the head of its Assembly section to prepare a report on the qualification and experience expected for the recruitment of some junior engineers for this unit.
   b. A fire broke out in your unit a fortnight ago causing considerable damage. As unit head prepare a report to the higher authority mentioning the causes of the fire and the measures to be adopted to prevent such accidents in future.

considerable damage. As unit head prepare a report to the higher authority mentioning the causes of the fire and the measures to be adopted to prevent such accidents in future.

c) Khosla Electronics plans to open a new showroom near Ruby Hospital in Kolkata to sell electronic products. You as a senior executive have to prepare a report on setting up the new outlet.

5. Fill in the blanks with suitable articles (a, an or the) where required. If no article is required, put a cross (X) in the blank space (any five) 5

a. It was _____ unique event.
b) He think he is _____ Rabindranath.
c) Many _____ admirer welcomed him.
d) All _____ cows have horns.
e) He became _____ member of _____ Bar.
f) He went to _____ school early today.
g) He worked for _____ hour.

6. Change the degree of comparison without change of the direction (any five) 5

a. Gold is the brightest of all metals (Comparative)
b. Ramen is not more intelligent than Suman. (Positive)
c. No other state in India is as fertile as Punjub. (Superlative)
d. Kolkata is not as large a city as London. (Comparative)
e. Minery is greater than any other mystery of all. (Superlative)
f. He is as intimate to me as to you. (Comparative)
g. He is not braver than I(am). (Positive)

7. Find the error in the following sentences if any and writer the correct one. (any five) 5

a. They advice me to see a doctor.
b. Kalidas is a Shakesapeare of India.
c. Do you know who am I?
d. He is wiser than me.
e. Distribute the apples between the boys.
f. All her life she had childlike trust in other people.
g. He is junior than me by four years.

8. Rewrite the following sentences according to the instructions given in brackets. (any ten) 10

a. Honey tastes sweet. (Passive voice)
b. You are a great fool. (Exclamatory sentence)
c. They cried as loudly as they could. (simple)
d. She danced like an expert dancer. (Complex)
e. He kept his promise. (Compound)
f. The woman shouted for help. (Direct speech)
g. Father said to me, " Go home at once." (Indirect)
h. Shut the door. (Passive voice)
I. He said to his friends, " Let us not miss the chance." (Indirect speech)
j. Is the bird seen by you? (Active voice)
k. He turned all the stones. (Negative)
l. The Giant loved the little boy most. The boy was never seen again. (join in to a complex sentence)
m. I can never forgot you. (Interrogative)

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding & Allied Processes-I (AME - 15, B-15(R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Question No.1 is compulsory. Answer any Four from the rest of the questions (Q.2 - Q.8) All the question carry equal marks Parts of a particular question should be answered at one place

1A. Choose the correct answer (any five) 1x5

a) The liquid used in cylinders to dissolve acetylene is (i) Kerosene
OR (ii) Acetone?

b) When three different resistors are connected in series, the current is : (I) equal in all the three resistors OR (ii) not equal in all three resistors.

c) The purpose of a rectifier is (i) to convert alternating current to direct current, OR (ii) to convert direct current to alternative current.

d) Argon provides good shielding to the arc because it is (i) lighter, OR (ii) heavier than air.

e) Constant voltage (CV) type power source are preferred for (i) GMAW & FCAW OR (ii) SMAW & GTAW.

f) The best way to store the compressed gas cylinders in the store room is: (i) In Vertical Position OR (ii) In Horizental Position.

g) In arc welding processes the depth of penetration is dominantly affected by: (i) Voltage OR (ii) Current?

1B. Write True or False (any five) 1x5

a) Helium can be used as an excellent fuel gas in oxy-fuel gas welding.

b) Friction Stir welding is a fusion welding process.

c) A welder engaged in MMAW faces the hazard of inhaling noxious gases and dust particles.

d) To avoid magnetic arc blow, the arc should be kept as short as possible.

e) Argon + Co_2 (80:20) gas shielding is extensively used in TIG welding.

f) High frequency arc starting is routinely used in MAG welding process.

g) In FCAW process as the welding progresses flux is added externally through a hopper.

1C. Answer any five: 2x5

a) Name two arc welding processes in which non-consumable electrodes are used. Give one example of semi-automatic arc welding process.

b) Mention two fuel gases commonly used in Oxy-fuel gas welding. Can you use argon as a fuel gas?

c) Name two inert gases used in welding. Co_2 gas is inert or active in nature?

d) A welding power source has a rating of 300A at 60% duty cycle. What does it mean?

e) Write only the names of two welding processes in each of fusion and solid state welding.

f) Name the welding process which normally used fused and agglomerated fluxes. Name some other welding /joining processes which also use flux.

g) Name a joining process which requires a flux, a filler metal and heat to join to metallic parts without melting the parts. Just name the mechanism by which the molten filler metal is drawn into the gap between the parts to be joined.

2. Why shielding is required in arc welding of metals? How shielding is provided in MMA, TIG and MIG and Submerged arc welding processes? 4+6

Mention four important defects seen in the welds made by each of the above mentioned processes. Please write the defects separately for each welding process. 10

3. a) Which is the fuel gas in oxy-acetylene gas welding? What are the functions of the fuel gas and the other gas in oxy-acetylene welding? Write the name of some other fuel gases used in Oxy-fuel gas welding. 1+3+2

b) Write the equation for chemical reaction in oxy-acetylene combustion. Is it an exothermic or endothermic reaction? 4+1

c) Name and draw the three types of oxy-acetylene flames, particularly showing the shape of the inner cone in each flame. which one is the mostly used in welding of metals? 6+1

d) Which type of flame produces more soot? After oxy-acetylene welding, which gas should be closed first? 1+1

4. a) Write the full expansion of the terms TIG and GTAW. Do these two terms indicate the same welding process? Which device is used in TIG welding to initiate the arc without touching the workpiece? Which shielding gases and gas mixtures are used in TIG welding of ferrous and non-ferrous metals, Name sone of the electrodes used in TIG welding. 2+1+1+3+3

   b) Draw Static Volt-ampere Characteristic curves of an arc welding power source of constant current type. Explain the concept of constant current with the help of the above curves. Such power sources are also referred as " Drooping" type- is it true or false? Name the welding process(es) where constant current power sources are used. 4+4+1+1

5. a) Write the expressions for (a) heat input in arc welding (b) and also for heat generated in a current carrying conductor. Mention units of measurements for each term used in the expressions. 8

   b) Write the names of two inert gases widely used in arc welding. Why they are referred to as "inert gas"? "Co_2 is an inert gas" - is this statement True or False? Write the name of two gas shielded arc welding processes, along with two shielding gases used by each of them. How is shielding of the weld pool is done in oxy-acetylene gas welding? 2+2+1+6+1

6. Write the full expansion of the terms SMAW and SAW. Write the main differences and similarities between these two welding processes. 8

   Describe both the welding processes very briefly. 12

7. a) Write the full expansion of the terms MIG, MAG and GMAW. What is the main difference between MIG and MAG processes? Do you think that both MIG and MAG are part of GMAW? 4

   b) Discuss the process of MIG welding, including the types of power sources, wire feeder and shielding gases used. What are the shielding gases and gas mixtures used in MAG welding of steel? 8+2

   c) what are the modes of metal transfer in GMAW? Discuss briefly with suitable sketches. 6

8. Write short notes on (any four): 4x5

a) Arc blow and its prevention.

b) Differences between Solid State and Fusion welding processes. Write two examples of each for Solid State and Fusion welding processes.

c) Duty cycle rating of a welding power source.

d) Main differences between soldering, brazing and welding.

e) Safety precaution in oxy-fuel gas welding.

f) FCAW

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Winter Session, December 2016
Sub : Fluid Mechanics (AME - B-13 (R))

Full Marks : 100

Time : 3 Hours

Pass Marks : 40

Answer any five Question
Parts of a question should be answered at one place

1. a) Differentiate between Solid and Fluid. 3+7+10 =20
   b) Explain classification of fluid by giving examples.
   c) A very large thin plate is centered in a gap of width 6cm with different oils of unknown viscosities above and below. The viscosity of one being twice that of the other. When the plate is pulled at a velocity of 30cm/s, the resulting force on one square meter of the plate due to viscous shear on both sides is 29.4N. Assuming Newtonian fluids, calculate viscosities of the oil.

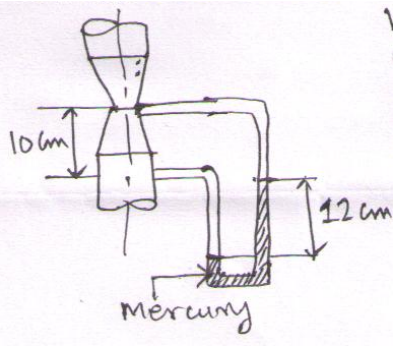
2. a). Explain boundary layer phenomenon over a flat plate with neat sketch. 8+12 =20
   b) Explain -(i) Vapour pressure, (ii) Froud No, (iii) Weber No, (iv) Mach No.

3. a) Explain with a neat sketch how fluid flow rate can be measured by orifice meter. 10+10 =20
   b) Prove from the first principles Euler's equation of motion .

4. a) A two dimensional flow can be described by $u = -y/b^2$, $v = x/a^2$. Verify that this is the flow of an incomparable fluid and that the ellipse $x^2/a^2 + y^2/b^2 = 1$ is a stream line. 8+12 =20
   b) Compare (i) Stream line & path line (ii) rotational flow & irrotational flow, (iii) Lagrangian motion & Eulerian motion, (iv) steady flow and unsteady flow.

5. a) A rectangular cannion is to be sunk to build the foundation of a bridge pier. It is in the form of an open boy, 15m x 6m in plan and 7m deep, and weighs 785KN. Determine how deep will it sink when launched? If the depth of water is 6m, what additional load will sink it to the bottom? 10+10 =20
   b) Explain with next sketch working principle of hydraulic press.

6. a) A vertical venturi meter shown in the figure has an area ratio of It has a throat diameter of 1cm. When oil of sp. gr. 0.8 flows through it the mercury in the differential garge indicates a difference in height of 12cm. Find the discharge through the Venturi meter. 10+10 =20



b) A model of a harbour has a length scale of 1/225. Storm waves of 20 meter amplitude and 10m/s velocity strike against the back water of the prototype harbour. Determine for the model (i)the size and velocity of the waves, neglecting viscous effects. (ii) if the time between the tides in the prototype is 12 hours, what should be the tidal period in the model?

7. a) Explain with neat sketch mechanism of turbulence. 10+10 =20

b) State and explain Prandtl's mixing length theory. Obtain an experience of mixing length.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Welding Applications (AME-21, C-21 (R))

Full Marks : 100 Time : 3 Hours

Pass Marks : 40

Answer any Five questions
Parts of question should be answered at one place.

1. Discuss any four of the following arc welding processes with reference to best quality obtainable, suitability for field welding, energy economy, amenability to automation and suitability for out of position welding: 20
   a) Shielded metal arc welding.
   b) tungsten inert gas welding.
   c) inert gas shielded metal arc welding.
   d) active gas shielded metal arc welding.
   e) flux corded arc welding.

2. a) Explain what is mean by quality level. 5
   b) What is fitness purpose? How is the quality level related to fitness for purpose? 5
   c) Explain the welding techniques available in the repair of a large medium carbon pressure vessel in order to avoid post weld heat treatment. 10

3. a) A steel pressure vessel subjected to hydraulic pressure has inner diameter 750mm and length 2000mm. The thickness is to be calculated depending on the pressure of water and the yield strength of the steel.
   Giving justification, recommended suitable material composition of the plates to be used. 10
   b) What are the various destructive and non destructive methods of inspection you would recommended for the above pressure vessel? 10

4. A 900 mm diameter pipe of 12mm thickness low carbon steel runs cross country. With the help of neat sketches, explain the pipe joints you would recommended, including edge preparation, use of backing etc. for the following and recommended a suitable welding processes:
   a) butt weld 8
   b) a 400 mm diameter pipe jointed perpendicular to the axis of the main pipe. 6
   c) a 400 mm diameter pipe jointed with its axis inclined at 45° to the axis of the main pipe. 6

5. Discuss Welding Procedure specification, Welding Procedure Qualification and Welder Performance Qualification. Your discussion should include typical forms for each of the above. Choose any welding process of your liking. 20

6. a) Two low carbon steel plates of dimension 700mm x 200mm x 12mm are to be butt welded along their length, using manual metal arc welding using shielded electrodes. Design a suitable joint preparation.
Name the fixed and variable costs that must be considered in quantity production when estimating the cost of welding. 10

b) Determine the cost per meter of 6mm fillet weld made manually with basic coated electrodes of 5mm diameter at a travel speed of 35 mm/min. The operating factor is 35% and the filler metal yield id 65%. The weight of the weld metal deposited is 0.190 kg./m. Welder pay rate is Rs.105/hr., power cost is Rs. 15/Kwh, and the covered electrode is Rs.55/kg. The overhead cost is 150% of labour cost. 10

7. a) Distinguish between welding defect, weld imperfection & weld discontinuity. Write down the factors to be considered for a weld repair plan. 3+5

b) Considering all possible welding defects appeared in the surface and inside weld of a circumferential joint made by SMAW process in a carbon steel pipe having 200 mm OP & 180 mm ID, prepare a list of defects and suitable NDT techniques to detect the defects. If mere than one NDT technique are applicable to identify any defect, which one you will prefer to apply in this case and why? 12

8. Write short notes on any three of the following : 20

a) relation of notch ductility to service at sub zero temperatures.

b) set on, set in and set through pipe connections.

c) Stove pipe welding of cross country pipe lines.

d) the variables, if changed, would require a re-test for welder performance qualification.

e) uphill vs. downhill pipe welding.

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Advanced Welding Technology (AME-24, C(24R))

Full Marks : 100

Pass Marks : 40

Time : 3 Hours

Answer any Five question
The parts of a questions should be answered at one place

1. a) Give a brief classification of surfacing/spraying processes.
   b) Define welding automation. What are the advantages and limitations of automatic welding?
   c) Write a short note on Buttering Layer used in joining dissimilar materials.
   d) What difficulties are involved in joining plastics? Give reasons. 5 x 4=20

2. a) What do you mean by surfacing? What are its important process variants? Explain the steps involved in surfacing. 8
   b) Explain the special considerations needed in surfacing as compared to welding. 4
   c) What are the different types of cladding techniques? Explain any two. 8

3. a) Explain the operating principle of Laser Beam welding. Give the reason why YAG crystal is preferred as host material in solid state laser welding systems? 10
   b) Explain the principal of stud welding in detail. What are the necessary steps to maintain weld quality and consistency in stud welds? 10

4. a) Explain carious friction welding variables. Give their mutual relationship in details. 10
   b) Describe the three-stage mechanistic model involved in diffusion welding. Enlist the influencing variables in this welding process. 10

5. a) What are the various metallurgical problems in dissimilar metal welding? Explain 10
   b) How will you select the filler metal and predict the micro-structure when joining stainless steel to a carbon or low alloy steel? Explain with the help of Schaeffler Diagram. 10

6. a) What is the principle of High Frequency welding joining polymers? Also explain the equipment used. 10

   b) Explain the Hot Gas welding process for welding of plastics. What are the advantages of this process over the other processes? 10

7. a) Write a short note on joining of composites. 6

   b) Differentiate between the manual joining, semiautomatic joining and automatic joining processes. 6

   c) Define Industrial Robot. Write a short note on future automation of welding processes. 8

THE INDIAN INSTITUTE OF WELDING

Associate Membership Examination
Summer Session, JUNE 2017
Sub : Applied Mechanics (AME - 05, A-5 (R))

Full Marks : 100

Pass Marks : 40

Time : 3 Hours

Group A
(Answer any ten questions)
Parts of a questions should be answered at one place

1. a) A boy is standing on a wall of height 5m above the ground. He observes a well nearby in the ground. The center of the well and the wall are 20m apart. The well has a diameter of 2m. He throws a buttet with the help of spring. The spring const is 10KN/m. He observes that the spring deflection is 6cm while throws the buttel. Find the rang of angle for which the buttel, falls in the well. 10

   b) What are parallel axis and perpendicular axis theorem for calculation M-I 2+1

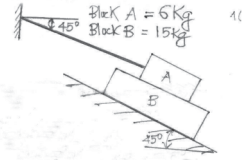
   c) A cycxilist, with a pot in a hand, observes that rain is falling vertically while he is standing and pot is filled with rain at the rate of $10cm^3/s$. Pot has diameter 20cm. Now, he moves with a speed of 20km/h. What will be the rate of filling of rain in the pot? 7

2. a) State Coloumb's Law of Dry friction. 3

   b) "Friction sometimes is beneficial to Mankind." - Explain. 2

   c) What are angle of friction and angle of repose. Relate between the two. 1+1+3=5

   d) μ_1 is the co-efficient of friction between A & B and μ_2 friction between Block B and the rough plane. Find the Value of μ_1 and μ_2. so that Blocks A and B maintain equilibrium. What would be tension in the cable. 10



d)	Prove that Power = Force x Velocity	2
e)	What is the difference between centroid and center of gravity.	2
f)	Show how a force system is reduced to a force and couple system.	2
g)	What is transmissibility of a force. Show with an example.	1