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Roll No. ..... Total Pages : 03

BT-3/D-25 43144

OPTICS AND WAVES

BS-201-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting atleast *one* question from each Unit.

Unit I

1. (a) What are Travelling waves ? Summarize the characteristics of travelling waves. 7

   (b) Compare the features of real light waves with those of ideal waves. 8

2. (a) What are electromagnetic waves ? Write constitutive relations. 8

   (b) Write Maxwell's equations. What are the physical significances of these equations ? 7

Unit II

3. (a) Explain the formation of interference fringes in Fresnel's biprism. 7

(b) How Fresnel's biprism is used to determine thickness of a thin transparent sheet ? **8**

4. (a) Explain principle, construction and working of Michelson's interferometer. **7**

(b) How Newton's ring experiment is useful to determine the refractive index of liquid ? **8**

Unit III

5. (a) What do you understand by diffraction grating ? Explain secondary maxima and secondary minima, width of principal maxima and absent spectra in context of diffraction grating. **10**

(b) Distinguish between Fraunhofer and Fresnel diffraction. **5**

6. (a) Describe the construction and working of Nicol prism. How Nicol prism can be used as an analyzer ? **8**

(b) What is a quarter-wave plate ? Deduce its thickness for a given wavelength in term of its refractive index. **7**

Unit IV

7. (a) What do you understand by the terms : Stimulated absorption, Spontaneous emission and Stimulated emission in context of LASER ? 7

   (b) Explain the construction and working of CO_2 LASER. 8

8. (a) Write a note on Ruby LASER. 8

   (b) Describe the characteristics of LASER beam. Write two industrial applications of LASER. 7

Roll No. ..... Total Pages : 04

BT-3/D-25 43156

HIGHER ENGINEERING MATHEMATICS

BS-204-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Each question carries equal marks.

Unit I

1. (a) Find the Laplace transform of $\left[\frac{e^t - \cos 2t}{t}\right]$.

(b) Find the inverse Laplace transform of $s \log\left(\frac{s-1}{s+1}\right)$.

2. (a) Using Convolution theorem, find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$.

(b) Solve the differential equation by using Laplace transform $\frac{d^2x}{dt^2} + x = t\cos 2t$, where $x(0) = 0$, $x'(0) = 0$.

Unit II

3. (a) Solve the partial differential equation $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$.

   (b) Find the complete integral of the equation $p^2 + q^2 = x + y$.

4. (a) Solve :

$$(D^2 - 2DD' + D'^2)z = \sin x.$$

   (b) Solve :

$$(4D^2 - 4DD' + D'^2)z = 16 \log (x + 2y).$$

Unit III

5. (a) Find a real root of the equation $x \log_{10} x = 1.2$ by using the Regula-Falsi method correct to four decimal places.

   (b) Find the positive root of the equation $x^4 - x = 10$, by Newton's method correct to four decimal places.

6. (a) Find the cubic polynomial which takes the following values :

x	:	0	1	2	3
$f(x)$	:	1	2	1	10

(b) The function $y = f(x)$ is given at the points (7, 3), (8, 1), (9, 1) and (10, 9). Find the value of y for $x = 9.5$ using Lagrange's interpolation formula.

Unit IV

7. (a) Find $\int_0^6 \frac{e^x}{1+x} dx$ approximately using Simpson's $\frac{3}{8}$th rule on integration.

(b) The table given below reveals the velocity v of a body during the time t specified. Find its acceleration at $t = 1.1$.

t	:	1.0	1.1	1.2	1.3	1.4
v	:	43.1	47.7	52.1	56.4	60.8

8. (a) Using modified Euler's method, find an approximate value of y when $x = 0.02$ and $x = 0.04$, given that $\frac{dy}{dx} = x^2 + y$ and $y = 1$ when $x = 0$.

(b) Using Runge-Kutta method of order 4, compute $y(0.4)$ for the equation $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$, by taking $h = 0.2$.

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Roll No. ..... Total Pages : 02

BT-3/D-25 43162

BASIC ELECTRONICS ENGINEERING
ES-203A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Discuss the concept, working principle and circuit diagram of half wave, full wave and bridge rectifiers in detail. **15**

2. Discuss the internal structure, working and input output characteristics of BJT in detail. **15**

Unit II

3. Differentiate between BJT and opamp. Discuss the applications of operational amplifiers as comparator, differentiator and integrator. **5+10**

4. Discuss the internal structure, pin diagram and various modes of operation of the 555 timer in detail. **15**

Unit III

5. Minimize using K-map F(A, B, C, D) = $\sum m(1, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15)$ and draw its circuit using NAND Gates only. **15**

6. Discuss the concept, working and truth table of various flip flops. Discuss mod-10 counter in detail. **15**

Unit IV

7. Discuss in detail the concept of modulation. Discuss amplitude modulation in detail. **5+10**

8. Discuss the concept of a cellular system and block diagram of GSM system in detail. **15**

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Roll No. 2023048408 Total Pages : 02

BT-3/D-25 43164

THEORY OF MACHINES
MEC-201A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Distinguish between the following : 15
   (i) Mechanism and machine.
   (ii) Analysis and synthesis of mechanism
   (iii) Kinematics and dynamics.

2. Describe various inversions of slider crank mechanism giving examples. 15

Unit II

3. (i) What is coriolis acceleration component ? How is it determined ?
   (ii) What is an acceleration image, how is it helpful in determining the accelerations of offset points on a link ? 15

4. (a) Compare the performance of knife edge, roller and mushroom followers. 8

(b) What is cam and what types of motion can be transmitted with a cam and follower combination ? 7

Unit III

5. Write short notes on the following terms : 15

(i) Applied and constraint forces

(ii) Principle of virtual work.

6. (a) Describe the balancing of reciprocating engines.

(b) What is force balancing of linkages ? 15

Unit IV

7. (a) What is crowning of pulleys in flat belt drives ?

(b) Derive the relation $T_1 / T_2 = e^{\mu\theta}$ for a flat belt drive. 15

8. (a) Explain simple Gear Train and compound gear train.

(b) Describe compound epicyclic gear. 15

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BT-3/D-25 **43165**

MECHANICS OF SOLIDS—I

MEC-203A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) A thin plate is a rectangle 200 mm×150 mm with a central circular hole of diameter 80 mm. Find I_{xx} about the centroidal x-axis parallel to the 200 mm side. 5

(b) A 200 N lamp is hung by two strings that make 60° and 30° with the horizontal on the left and right respectively. Find the tensions T_1 and T_2. 6

(c) Write the parallel axis theorem and perpendicular axis theorem. 4

2. (a) Draw and discuss stress strain diagram for mild steel subjected to axial tensile load. **6**

(b) A steel rod ABCD 4.5 m long and 25 mm in diameter is subjected to the forces as shown in Fig. If the value of Young's modulus for the steel is 200 GPa, determine its deformation. **9**

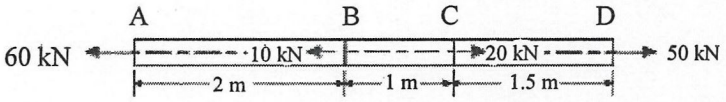

Fig.

Unit II

3. The state of stress in a two-dimensionally stressed body is as shown in Fig. Determine principal stresses, principal planes and maximum shear stress. Determine also the normal and tangential stresses on plane AC. **15**

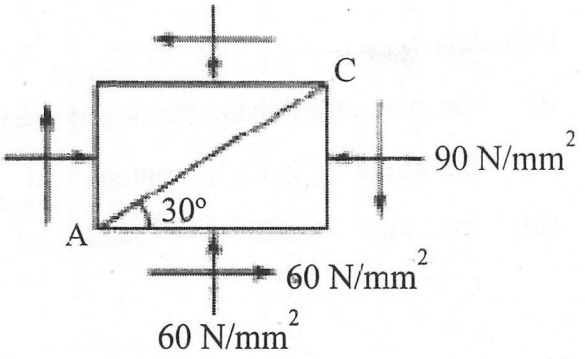

Fig.

4. A beam of length 6 m is simply supported at the ends and carries a uniformly distributed load of 1.5 kN/m run and three concentrated loads of 1 kN, 2 kN and 3 kN acting at a distance of 1.5 m, 3 m and 4.5 m respectively from left end. Draw the S.F. and B.M. diagrams and determine the maximum bending moment. **15**

Unit III

5. (a) Define Torsional rigidity and how is it related with strength of a shaft. **5**

(b) A solid steel shaft 60 mm diameter and 800 mm long transmits 35 kW at 200 r.p.m. **10**

Calculate :

(i) the maximum shear stress produced;

(ii) the angle of twist in degrees and

(iii) the shear stress at a radius of 25 mm.

$C = 80\ GN/m^2$

6. (a) Show that for a beam subjected to pure bending, neutral axis coincides with the centroid of the cross-section. **6**

(b) A spring steel strip, 25 mm wide and 1.5 mm thick, is bent to an arc of a circle of 2 m radius. Calculate the bending moment necessary and the maximum stress set up.

E for steel = $200\ GN/m^2$. **9**

Unit IV

7. (a) Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as

2.3 m and hinged at its both ends. Take E = 205 kN/mm^2. Also determine the crippling load by Rankine's formula using $f_c = 335N/mm^2$ and $a = 1/7500$. **10**

(b) What is equivalent length of a column ? How is the concept used in the column theory ? **5**

8. A beam of length 6 m is simply supported at the ends and carries two-point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Compute the slope and deflection under each load. Assume EI = 17000 $kN\text{-}m^2$.

Use Macaulay's Method. **15**

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BT-3/D-25 43166

THERMODYNAMICS

MEC-205A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Define Polytropic law. Derive an expression for polytropic heat, polytropic specific heat and polytropic index. 15

2. (i) Explain throttling process with its applications. 8

   (ii) Describe the different types of thermodynamics properties. 7

Unit II

3. A reversible heat engine receives heat from two thermal reservoirs maintained at constant temperatures of 750 K and 500 K. The engine develops 100 KW and rejects

3600 kj/min of heat to a heat sink at 250 K. Determine the thermal efficiency of the engine and heat supplied by the each thermal reservoir. **15**

4. Air at 15°C and 1.05 bar occupies 0.02 m^3. The air is heated at constant volume until the pressure is 4.2 bar and then cooled at constant pressure back to the original temperature. Calculate the net heat flow to or from the air and the net entropy change. Sketch the process on a T-s diagram. **15**

Unit III

5. Water is to be heated at constant pressure from 25°C to 80°C. If the heat source is at a constant temperature of 500°C and the ambient temperature is 20°C, what would be the gain in availability of water and the effectiveness of the heating process ? For water take C_p = 4.187 kJ/kg K. **15**

6. Determine the enthalpy, volume, internal energy and entropy of the saturated steam at 15 bar pressure and 220°C. The volume of water may be neglected and take specific heat of superheat equal to 2.2 kj/kg K. **15**

Unit IV

7. Derive Maxwell's equations and state their importance in thermodynamics. 15

8. Write short notes on the following : 15

   (i) Brayton cycle.

   (ii) Joule cycle

   (iii) Atkinson cycle.

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Roll No. ..... Total Pages : 3

45195

BT-5/D-25

HEAT TRANSFER

Paper : MEC-301-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions, selecting at least *one* question from each unit. Assume any missing data suitably.

UNIT–I

1. (i) Define heat transfer and explain its three modes with examples. (6)

(ii) Saturated steam at 110°C flows inside a copper pipe (k = 450 W/mK) having an internal diameter of 10 cm and an external diameter of 12 cm. The surface resistance on the steam side is 12000 W/m^2 K and that on the outside surface of pipe is 18 W/m^2 K. Determine the heat loss form the pipe if it is located in space at 25°C. How this heat loss would be affected if the pipe is lagged with 5 cm thick insulation of thermal conductivity of 0.22 W/mK. (9)

2. Derive the general heat conduction equation in Cartesian coordinates. (15)

UNIT–II

3. (a) Discuss the importance of Prandtl number. (6)

   (b) Air at atmospheric pressure and 24°C flows with a velocity of 10 m/s along a flat plate 4 m long, which is maintained at a uniform temperature of 130°C. Assuming $Re_c = 2 \times 10^5$, determine (a) the local heat transfer coefficient at 2 m, 3 m and 4 m from the leading edge, (b) the average heat transfer coefficient and (c) the heat transfer rate from the plate. (9)

4. A vertical cylinder 1.5 m high and 180 mm in diameter is maintained at 100°C in an atmosphere environment of 20°C. Calculate the heat loss rate by free convection from the surface of the cylinder. The appropriate correlation for Nusselt number is $Nu = 0.10\ (Gr \times Pr)^{1/3}$.

   The relevant thermo-physical properties of air at mean film temperature are : $\rho = 1.06$ kg/m^3, $k = 0.02894$ W/m °C, $\nu = 18.97 \times 10^{-6}$ m^2/s, $c_p = 1.004$ kJ/kg °C. (15)

UNIT–III

5. Derive Stefan–Boltzmann law and explain the concept of blackbody radiation. (15)

6. Calculate the net radiant heat exchange per m^2 area for two large parallel plates (ε = 0.9, 0.6) at temperatures of 427°C and 27°C respectively. If a polished aluminium shield is placed between them, find the percentage reduction in the heat transfer (ε = 0.4). (15)

UNIT–IV

7. Explain the concept of heat exchanger effectiveness and derive the relation for parallel flow heat exchanger. (15)

8. In a certain double pipe heat exchanger hot water flows at a rate of 5000 kg/h and gets cooled from 95°C to 65°C. At the same time 50,000 kg/h of cooling water at 30°C enters the heat exchanger. The flow conditions are such that the overall heat transfer coefficient remains constant at 2270 W/m^2K. Determine the heat transfer area required and the effectiveness, assuming two streams are in parallel flow and have c_p = 4.2 kJ/kgK. (15)

Roll No. ..... Total Pages : 3

45196

BT-5/D-25

PRODUCTION TECHNOLOGY

Paper–MEG-303-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Explain mechanism of chip formation in case of machining operations. Explain the effect of cutting temperature during machining. (7.5)

   (b) Explain the relationship in various forces involved in orthogonal machining operation (lathe) with the help of neat diagram using Merchant equation. (7.5)

2. (a) Explain any three machining operations out of the following :

   (i) Turning.

   (ii) Drilling.

   (iii) Boring. (7.5)

(b) Explain any three out of the following :

(i) Slab milling operation.

(ii) End milling operation.

(iii) Grinding Operation.

(iv) Grinding wheels. (7.5)

UNIT–II

3. (a) Define Tool life with the help of Taylor Tool life equation. Also explain the different types of cutting fluids alongwith their merits, demerits and applications. (7.5)

(b) Explain different types of cutting tool materials alongwith their properties, merits, demerits and citing their applications. (7.5)

4. (a) Explain linear, angular and form measurement (one example in each case) using neat diagrams. (7.5)

(b) Explain tolerance and different types of fits using neat diagrams using any one system (shaft basis system or hole basis system). (7.5)

UNIT–III

5. (a) Explain thread cutting on lathe & thread rolling in details with the help of neat diagrams. (7.5)

(b) Explain thread chasing, thread tapping and thread grinding in detail. (7.5)

6. (a) Define the Jig and explain important considerations while designing the jigs. Explain any two types of jigs with the help of neat diagrams. (7.5)

(b) Explain modular fixture, magnetic work holder and electrostatic work holders briefly. (7.5)

UNIT–IV

7. (a) Explain different types of gears and its terminology with the help of neat diagrams. (7.5)

(b) Explain any three methods used to manufacture the gears with the help of neat diagrams. (7.5)

8. (a) Explain the CNC alongwith its important components, features, merits, demerits and applications. (7.5)

(b) Write the CNC program for any lathe job by drawing its diagrams first. (7.5)

Roll No. ..... Total Pages : 3

45197

BT-5/D-25

MECHANICAL VIBRATIONS AND TRIBOLOGY

Paper : MEC-305-A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. Differentiate between free and forced vibrations. What is the work done by a harmonic force in a vibratory system? Derive and discuss the equation of motion for an undamped spring-mass system. (15)

2. Derive differential equations governing damped free vibration and outline the conditions for underdamped, overdamped, and critically damped systems. (15)

UNIT–II

3. Drive the differential equations for the principal coordinates of free undamped vibrations of a two degree-of-freedom system with natural frequencies ω_1 and ω_2. (15)

4. A large machine has a mass of 200 kg and is mounted on an undamped elastic foundation of stiffness 2.5 106 N/m as shown in **1(a).** During operation at 110 r/s, the machine is subject to a harmonic force of magnitude 2200 N. (a) Determine the steady-state amplitude of the machine as it operates. (b) Determine the required stiffness of an undamped vibration absorber of mass 20 kg such that steady-state vibrations of the machine are eliminated during operation. (c) Determine the amplitude of the absorber mass when the vibration absorber of **part (b)** is used. (d) What are the natural frequencies of the resulting two degree-of-freedom system? (15)

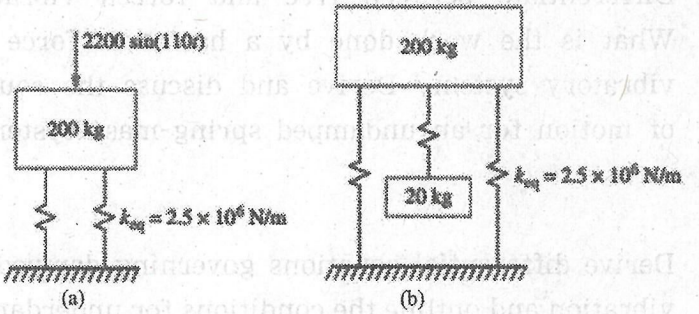

Fig. 1

UNIT–III

5. With a neat block diagram, explain matrix methods for solving multi-DOF vibratory systems. (15)

6. Discuss the physical significance of mode shapes and orthogonality in continuous systems. (15)

UNIT–IV

7. Explain the maintenance and conservation methods of lubricants. How the storage and handling of lubricants are to be done? (15)

8. Define wear. Classify the types of wear. Derive the equation of volume of wear due to adhesion. (15)

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45258

BT-5/D-25

UNIVERSAL HUMAN VALUES-II :
UNDERSTANDING HARMONY
Paper–HTM-901A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions selecting at least *one* question from each unit.

UNIT–I

1. Discuss the concept of natural acceptance and experiential validation in the self exploration method with suitable examples from your own life. (15)

2. Discuss the basic human aspirations in detail with their priority order. Differentiate between skill and value education and their priority in human life. (7+8=15)

UNIT–II

3. Discuss the needs, activities and response of self and body in detail. Discuss the concept of body as instrument of self. (10+5=15)

4. Discuss the concept of sanyam (self regulation) for health as a natural outcome of it. Differentiate between prosperity and accumulation of wealth. (10+5=15)

UNIT–III

5. Discuss the feeling of trust and respect in detail with the help of suitable examples from your life. (15)

6. Discuss the concept of harmony in society from family to world family. Discuss the five basic systems to achieve the world family. (6+9=15)

UNIT–IV

7. Discuss the concept of mutual fulfilment in nature with the help of suitable examples. Discuss the cause of imbalance in nature in today's world. (15)

8. Discuss the concept of ethical conduct and professional ethics in light of universal human values. Discuss the concept of coexistence as existence in detail. (7+8=15)

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47338

BT-7/D-25

SMART MATERIALS

Paper : MEO-401A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions, selecting at least *one* question from each unit. Assume any missing Data.

UNIT–I

1. Discuss about the important properties of smart materials. Also discuss the applications of smart materials in different fields. (15)

2. (a) Explain the classification of smart materials. (7)

   (b) What is a smart system? What are the components of smart System? (8)

UNIT–II

3. (a) What is basically the concept of "smart sensors"? Explain the essential elements of a "Smart sensor" unit with a neat diagram. (9)

   (b) Discuss the concept and principles of magnetic actuations. (9)

4. What is the difference between passive and reactive sensory smart structure? Classify the smart structure along with their applications. (15)

UNIT–III

5. What is a shape memory alloy? How do they work? What metals exhibit shape memory characteristics? Discuss the applications of shape memory alloys. (15)

6. (a) What do you understand by smart battery? Discuss about technology involved behind the working of battery. (9)

   (b) Discuss different types of batteries along with their applications in industries. (6)

UNIT–IV

7. Explain in details about structure of carbon nanotubes. How these are different from non-carbon nanotubes? (15)

8. Explain the synthesis and purification methods for carbon nanotubes. (15)

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47343

BT-7/D-25

AUTOMATION IN MANUFACTURING

Paper : MEC-401A

Group-I

Option-(i)

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT–I

1. (i) Define Production systems. Explain manual labour in production system. (8)

   (ii) Define Robot anatomy, and its related strategies. (7)

2. (i) What is ROBOT, Explain various common robot configuration. (8)

   (ii) Describe the end effectors and grippers and tools. (7)

UNIT–II

3. (i) Explain The Part Families, Part classification and coding. (7)

   (ii) What is cellular Manufacturing-composite part concept and application of GT. (8)

4. (i) Write a note on FMS layout, Types of FMS, and deadlocks in FMS. (7)

   (ii) Elucidate various FMS components. (8)

UNIT–III

5. (i) Give details of both approaches (regenerative approach and variant approach) of CAPP. (9)

   (ii) Introduce Artificial Intelligence (AI). (6)

6. Explicate shop floor system and SFC functions. (15)

UNIT–IV

7. (i) Describe the Historical Background of NC, CNC and Part programming. (10)

   (ii) Explain Basic components of an NC system. (5)

8. (i) Explain Carousal storage systems and analysis of storage system.

   (ii) Differentiate between conventional and automated storage system. (15)

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47344

BT-7/D-25

COMPUTER AIDED DESIGN

Paper : MEP-401A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT–I

1. (a) Explain the typical CAD/CAM Product cycle in contemporary manufacturing system. (9)

   (b) What are the challenges for engineers in the field of CAD/CAM? (6)

2. (a) Write brief note on LAN, MAN and WAN. (15)

UNIT–II

3. Write a short note on :

   (a) Data base management.

   (b) Data Structure. (15)

4. Drive the transformation matrix for a 2D scaling and shearing. (15)

UNIT–III

5. (a) Discuss and write the difference between wire frame modeling and surface modeling. (8)

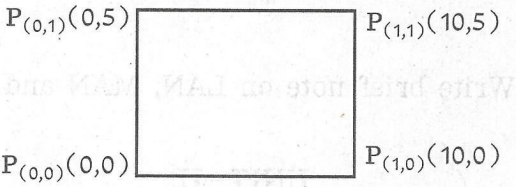
   (b) What are the solid model construction techniques? Explain any one of them in detail. (7)

6. (a) Discuss the parametric representation for line and circle. (8)

   (b) Explain and discuss the importance of Hermit cubic spline curve. (7)

UNIT–IV

7. Find the equation of the Coons surface with four corner points as shown. Find the midpoint point of the surface. (15)



8. (a) Describe briefly the various data exchange systems currently in use.

   (b) Discuss the neutral file format. (15)

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47348

BT-7/D-25

INDUSTRIAL ROBOTICS

Paper–MEP-409A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt any *five* questions, selecting at least *one* quesions from each unit.

UNIT–I

1. What is an industrial robot and write briefly on classification of industrial robots? What is payload capacity of a robot? (15)

2. Describe various applications of 'industrial robots'. Also discuss the role of end effectors. (15)

UNIT–II

3. Discuss the uses of sensors in robots. Write briefly on characteristics of end-of-arm tooling. (15)

4. What is a sensor? Write briefly on different types of position sensors. (15)

UNIT–III

5. Write briefly on various considerations during designing of a robot material handling system. (15)

6. Describe the concept and working of vacuum and magnetic grippers. (15)

UNIT–IV

7. Write briefly on :

   (a) Robot Cell Layout. (7)

   (b) Manipulator Path Control. (8)

8. What is a manipulator? Describe different factors affecting design of a work cell. (15)

Roll No. ..... Total Pages : 2

BT–8/D-25 **48375**

AUTOMOBILE ENGINEERING

Paper–MEP–404A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Why multicylinder engine is used for high power instead of single cylinder? Also write its advantages. 10

   (b) What is a self adjusting clutch? 5

2. (a) What is the function of a Clutch? Discuss various factors affecting the torque transmission in a Clutch. 10

   (b) Where and why do we use multiplate clutches? 5

UNIT–II

3. (a) Describe in detail various types of Gear selector mechanisms used in Automobiles. Discuss also the advantages and disadvantages of each and state what the modern trend is? 12

(b) What is Synchronise? 3

4. Drive expression for the following in a Hooke's joint. 15

(a) Velocity ratio.

(b) Angular acceleration of the driven shaft.

UNIT–III

5. Distinguish between Semi floating and Fully floating rear axles with the aid of suitable sketches and explain their relative merits and demerits. 15

6. Discuss the Design considerations regarding the Discs and the friction pads of Disc brakes. 15

UNIT–IV

7. Differentiate clearly between the functions of a Spring and a Shock absorber. Explain the construction and working of a Telescopic type of shock absorber with the help of a neat diagram. 15

8. Discuss in detail the Ackermann steering mechanism. 15

Roll No. ..... Total Pages : 3

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WELDING TECHNOLOGY

Paper–MEP–408A

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. Explain the Historical development of Welding from early metalworking to modern welding technology. Describe the primary functions of Welding in Industry and give examples of applications in three different sectors. 15

2. Compare and contrast any three types of Solid State Welding techniques in terms of mechanism, applications and advantages. 15

UNIT–II

3. Describe the working principle of Arc welding processes. Explain static characteristic curves of Welding power sources, open circuit voltage, current rating and duty cycle. How do these parameters influence selection of a power source for a given welding job? 15

4. Discuss different types of AC and DC welding power sources and arc welding transformers. Explain methods used to control welding current in transformers and compare arc welding transformers, generators, and rectifiers. 15

UNIT–III

5. (a) Illustrate with neat sketches the working of various types of Gas regulators used on cylinders in Gas welding. 7

   (b) Explain with neat sketches construction and working of various types of Blow pipes used in Gas welding. 8

6. Illustrate the following operations involved in the handling of Gas welding equipment :

   (a) Selection of Welding torch tip size. 5

   (b) Selection of Welding rod size. 5

   (c) Welding torch position and movement. 5

UNIT–IV

7. Explain the following methods of Inspection and Testing of Welds giving principle, equipment, advantages, limitations, and typical defects detectable: magnetic particle inspection and Eddy Current Inspection. 15

8. (a) Describe TIG welding of aluminum and magnesium including equipment, surface preparation, common problems such as aluminum arcing and balling tungsten and procedures to obtain sound aluminum welds. 8

(b) Explain MIG welding of Steel and Stainless steel covering metal transfer modes, wire selection, common practice tips and control of distortion and residual stresses. 7