BTS – III – 11.13 – 1162

B. Tech. Degree III Semester Examination November 2013

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 1301 ENGINEERING MATHEMATICS II

(2012 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Find the rank of the matrix.

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \end{bmatrix}$$

(b) Check whether the vectors $X_1 = (1,1,2)$, $X_2 = (1,2,5)$ and $X_3 = (5,3,4)$ are linearly dependent or not.

(c) Find the Laplace transform of $t^2\, u(t-3)$

(d) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t} dt$

(e) Find the Fourier sine and cosine integrals of $f(x) = e^{-kx}$, for $x > 0, k > 0$

(f) Express $f(x) = x$ as a Fourier cosine series in $0 < x < 2$

(g) Find the work done by the force $\overline{F} = 3xy\,\overline{i} - y^2\,\overline{j}$ when it moves a particle along the curve $y = 2x^2$ in the xy plane

(h) Find (i) $\nabla^2\left(\frac{1}{r}\right)$ where $r = |\overline{r}|$ and (ii) $\nabla\left(\frac{1}{r}\,\overline{r}\right)$

PART B

(4 x 15 = 60)

II. (a) Test for consistency of the following system of equations and solve them if consistent: (8)

$$x_1 + x_2 - x_3 = 0$$
$$2x_1 - x_2 + x_3 = 3$$
$$4x_1 + 2x_2 - 2x_3 = 2$$

(b) Verify Cayley Hamilton theorem and hence find A^4 (7)

$$A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

OR

(P.T.O.)

III. (a) For what values of k the equations $x+y+z=1, 2x+y+4z=k$, $4x+y+10z=k^2$ have a solution and solve them completely in each case. (10)

(b) Check whether $W=\{(a,b,o): a=b^2, a,b,\in R\}$ is a subspace or not (5)

IV. Find the inverse Laplace transform of

(i) $\dfrac{5S+3}{(S-1)(S^2+2S+5)}$ (5)

(ii) $\tan^{-1}\left(\dfrac{2}{S}\right)$ (5)

(iii) $\log\left(\dfrac{1+S}{S}\right)$ (5)

OR

V. (a) Solve the equation : $y^{11}-3y^{1}+2y=4t+e^{3t}$ when $y(0)=1$, $y^{1}(0)=-1$ (8)

(b) Apply convolution theorem to evaluate $L^{-1}\left\{\dfrac{1}{S(S^2+4)}\right\}$ (7)

VI. (a) Find the Fourier transform of e^{-x^2} (8)

(b) Solve the integral equation:

$$\int_0^\infty F(x)Cos\,px\,dx=\begin{cases}1-p & 0\le p\le 1\\ 0 & p>1\end{cases}$$ (7)

OR

VII. (a) Obtain the Fourier series for the function $f(x)=x^2, -\pi<x<\pi$. Hence show that (10)

(i) $1+\dfrac{1}{2^2}+\dfrac{1}{3^2}+.....=\dfrac{\pi^2}{6}$

(ii) $1-\dfrac{1}{2^2}+\dfrac{1}{3^2}-\dfrac{1}{4^2}+.....=\dfrac{\pi^2}{12}$

(iii) $1+\dfrac{1}{3^2}+\dfrac{1}{5^2}+.....=\dfrac{\pi^2}{8}$

(b) Find the finite Fourier Sine transform of $f(x)=2x\ in\ 0<x<4$ (5)

VIII. (a) Verify divergence theorem for $\overline{F}=x^2\overline{i}+z\overline{j}+yz\overline{k}$ over the cube formed by $x=\pm1, y=\pm1, z=\pm1$ (9)

(b) Prove that $\nabla.(\nabla x\,\overline{A})=0$ for any vector function $\overline{A}$ (6)

OR

IX. (a) Verify Stoke's theorem for $\overline{F}=(2x-y)\overline{i}-yz^2\overline{j}-y^2z\overline{k}$ where S is the upper half of the sphere $x^2+y^2+z^2=1$ and C is the circular boundary in the XY plane. (8)

(b) Show that $\overline{F}=(y^2+2xz^2)i+(2xy-z)\overline{j}+(2x^2z-y+2z)\overline{k}$ is irrotational and hence find its scalar potential. (7)

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BTS – III – 11.13 – 1164

B. Tech. Degree III Semester Examination November 2013

IT/ME 1302 ELECTRICAL TECHNOLOGY

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Derive the emf equation of a transformer.

(b) What do you mean by CT and PT? Where are they used?

(c) Explain the conditions for voltage build up of a self excited DC shunt generator.

(d) Explain the significance of back emf in a dc motor.

(e) Explain how the torque is developed in a rotor of 3ϕ induction motor.

(f) Explain the different methods of starting synchronous motors.

(g) List the various electrical equipments used in power stations.

(h) Discuss the advantage of high voltage transmission.

PART B

(4 x 15 = 60)

II. The following readings were obtained from OC and SC tests on 3KVA, 220V/110V, 50Hz transformer. (15)

OC test (lv side : 110V, 0.9A, 38W

SC test (hv side) : 15V, 13.6A, 45W

Calculate:

(i) the equivalent circuit constants w.r.t. HV side

(ii) voltage regulation and efficiency for 0.8 lagging power factor load.

(iii) The efficiency at half full load and 0.8 pf load.

OR

III. (a) Draw and explain the no load phasor diagram of a single phase transformer (5)

(b) A transformer rated for 10KVA, 2000V/200V, 50Hz when tested took 200W on OC test at rated voltage and 250W on SC test with full load current circulated in the windings. Determine the efficiency at full load, 0.8 pf lagging and the KVA loading to give maximum efficiency at upf. (10)

IV. (a) Derive the emf equation of a generator (5)

(b) A shunt motor takes an armature current of 50A at 250V when running on full load, at a speed of 800 rpm. The armature resistance is $0.2\,\Omega$. If the field strength is reduced by 10% and the torque remains the same, determine the steady speed attained and the armature current. (10)

OR

(P.T.O.)

V. (a) Explain the effect of armature reaction. How is it compensated? (7)

(b) A dc shunt generator is having 600 wave connected conductors. The flux per pole is 0.06wb and the machine is having 6 poles. The armature is rotating at a speed of 900rpm. The armature resistance is $0.05\,\Omega$, field circuit resistance is $100\,\Omega$. Calculate the output of the generator if the terminal voltage is 1550V. (8)

VI. (a) Define voltage regulation of an alternator. Explain the EMF method of finding voltage regulation. (7)

(b) A three phase 16 pole alternator has a star connected winding with 144 slots and 10 conductors/slot. The flux/pole is 0.03 wb sinusoidally distributed and the speed is 375 rpm, find the frequency, the phase and line emf. Assume full pitched coil. (8)

OR

VII. A 6 pole 50Hz 3ϕ induction motor running on full load with 3% slip develops a torque of 160Nm at its pulley rim. The friction and windage losses are 210W and stator copper and iron losses equal to 1640W. Calculate. (15)
(i) Rotor slip (ii) Efficiency at Full load (iii) Rotor Cu loss

VIII. Explain the working of thermal power plant with the help of neat schematic diagram (15)

OR

IX. (a) What is corona? What are the factors affecting corona? (7)

(b) Explain hydroelectric power generation with neat sketch. (8)

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BTS– III – 11.13. 1186

B.Tech. Degree III Semester Examination November 2013

ME 1303 MECHANICS OF SOLIDS

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Draw stress-strain diagram for ductile and brittle materials and indicate salient points.

(b) Explain the significance of Mohr's Circle and its uses.

(c) A circular shaft is subjected to a torque of 10kNm. The power transmitted by the shaft is 209.33KW. Find the speed of shaft in rpm.

(d) What do you mean by point of contra flexure? Is the point of contra flexure and point of inflexion different?

(e) What do you understand by neutral axis and moment of resistance? How do you locate neutral axis?

(f) Sketch and explain the shear stress distribution in a symmetrical I-Section.

(g) Obtain the maximum value of deflection for a cantilever of length 'L', constant 'EI' and carrying concentrated load 'W' and the end.

(h) Discuss the effect of the slenderness ratio of a column over buckling load.

PART B

$(4 \times 15 = 60)$

II. A compound tube consists of steel tube 170mm external diameter and 10mm thickness and an outer brass tube 190mm external diameter and 10mm thickness. The two tubes are of equal length. The compound tube carries an axial load of 1MN. Find the stresses and the load carried by each tube and the amount by which it shortens. Length of each tube is 200mm. $E_{steel} = 200GN/m^2$ and $E_{Brass} = 100\ GN/m^2$.

OR

III. The normal stresses acting on two perpendicular planes at a point in a strained material are $70MN/m^2$ $(tensile)$ and $35\ MN/m^2$ $(compressive)$. In addition, shear stress of $40MN/m^2$ act on these planes. Calculate,

i) The magnitude of principal stresses

ii) The direction of principal stresses

iii) The magnitude of the maximum shear stress

IV. A solid circular shaft transmits 75 KW power at 200rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed one degree in 2m length of the shaft and shear stress is not to exceed $50N/mm^2$. Assume the modulus of rigidity of the material of the shaft as $100\ KN/mm^2$.

OR

(P.T.O.)

V. An overhanging beam ABC is simply supported at A and B over a span of 6m and BC overhangs by 3m. If the supported span AB carries central concentrated load of 8kN and over hanging span BC carries 2 kN/m completely. Draw shear force and bending moment diagrams indicating salient points.

VI. A simple beam of span 10m carries a UDL of 3kN/m. The section of the beam is a 'T' having a flange of 125x125mm and web 25x175mm. For the critical section obtain the shear stress at the neutral axis and at the junction of the flange and the web. Also draw the shear stress distribution across the section.

OR

VII. Discuss on various theories of failures and their applications to ductile and brittle materials.

VIII. A beam of length 10m is simply supported at its ends and carries two point loads of 100kN and 60kN at a distance of 2m and 5m respectively from the left support. Calculate the deflections under each load. Find also the maximum deflection also. Take $I = 18 \times 10^8 mm^4$ and $E = 2 \times 10^5 N/mm^2$.

OR

IX. A column of solid circular section 12cm diameter, 3.6m long is hinged at both ends. Rankine's constant is $^1/1600$ and $\sigma_c = 54 kN/cm^2$. Find the buckling load. If another column of the same length, end conditions, and Rankine's constant but of 12cmx12cm square cross-section, and different material, has the same buckling load. Find the value of σ_c of its material.

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BTS – III – 11.13 – 1201

B. Tech. Degree III Semester Examination November 2013

ME 1304 FLUID MECHANICS

(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Distinguish between dynamic viscosity and kinematic viscosity.

(b) Explain the terms metacentre and metacentric height.

(c) Explain minor losses in pipes.

(d) Briefly explain significance of Moody's chart.

(e) A fluid flow is given by $V = 8x^3i-10x^2yj$. Verify the flow is rotational or irrotational.

(f) What is magnus effect?

(g) Define displacement thickness, momentum thickness and the energy thickness.

(h) Briefly explain skin friction drag.

PART B

(4 x 15 = 60)

II. (a) Briefly explain various properties of fluids. (8)

(b) A flat plate of area $1.5x10^6$ mm^2 is pulled with a speed of 0.4m/s relative to another plate located at a distance of 0.15mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise. (7)

OR

III. (a) Briefly describe (i) Stream lines (ii) Stream tubes (iii) Streak lines (iv) Path lines (8)

(b) What is Reynold transport theorem and fluid dynamics concept of control volume. (7)

IV. (a) Derive Hagen Poiseuille Formula. (8)

(b) An oil of viscosity $0.1NS/m^2$ and relative density 0.9 is flowing through a circular pipe of diameter 50mm and of length 300m. The rate of flow of fluid through the pipe is 3.5 litre/s. Find the pressure drop in a length of 300m. (7)

OR

(P.T.O.)

V. (a) Briefly describe an orifice meter and a pitot tube. (8)

(b) A pitot-static tube placed in the centre of a 300mm pipe line has one orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60mm of water. Take the co-efficient pitot tube as $C_V = 0.98$. (7)

VI. In a two dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that the velocity potential exists and determine its form. Find also the stream function. (15)

OR

VII. (a) Briefly describe doublet. (5)

(b) A point P(0.5,1) is situated in the flow field of a doublet of $5m^2/s$. Calculate the velocity at this point. (10)

VIII. (a) Briefly explain the boundary layer procedure (5)

(b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and $u = U$ at $y = \delta$, where $\delta =$ boundary layer thickness. Also calculate the value δ^* / θ. (10)

OR

IX. (a) Explain Von Karman momentum integral equation. (6)

(b) Explain laminar boundary layer and turbulent boundary layer with sketch. (9)

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BTS – III– 11.13 – 1217

B.Tech. Degree III Semester Examination November 2013

ME 1305 METALLURGY AND MATERIAL SCIENCE

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Calculate the density of BCC iron if its atomic radius is 1.241 °A .

(b) Metals in general deform by a force which is less than their theoretical strength. Explain.

(c) Which lead – tin alloy will be ideal for joining electronic assemblies? Give reason.

(d) Discuss briefly the classification of protective coatings.

(e) Compare an elastic and visco elastic deformation.

(f) What is an S-N curve? What useful information is obtained from such a curve?

(g) What is a stainless steel and why it is stainless?

(h) Comment on shape memory alloys.

PART B

(4 x 15 = 60)

II. (a) Obtain the atomic density on (100), (110) and (111) planes of FCC copper. Lattice constant = 3.61 °A . Identify the slip plane. (8)

(b) Discuss the Fick's law of diffusion and the metallurgical application of diffusion. (7)

OR

III. (a) Explain the characteristics of dislocations. (5)

(b) Briefly explain heterogeneous nucleation mechanism. (5)

(c) Discuss the formation of dendritic pattern during solidification. (5)

IV. (a) Nickel, Aluminium and Copper have face cantered cubic structure yet Ni is soluble in copper whereas Al has only a limited solubility. Explain why it is so. (5)

(b) Explain eutectic, eutectoid and peritectic reactions. (10)

OR

V. (a) Which microstructure in eutectoid steel has maximum hardness? Give reasons. (5)

(b) Hardening of steel is always followed by tempering. Is it true or false? Justify your answer. (5)

(c) What is the need and principle of surface hardening of steels? Explain. (5)

VI. (a) Discuss any two strengthening mechanisms. (5)

(b) Explain the difference between recoverable and permanent deformation. (5)

(c) What is the difference between failure of a material by creep and that by stress rupture? (5)

OR

VII. (a) Discuss the mechanism of fatigue failure. (5)

(b) What are the different stages in the creep curve? (5)

(c) What necessitates recovery and recrystallisation processes? How do they influence the properties of materials? (5)

VIII. (a) Name five alloys each of ferrous and non ferrous metals. Write their composition, properties and applications. (10)

(b) What is a super alloy? How is it different from stainless steel? (5)

OR

IX. (a) What are properties and applications of various types of cast iron? (10)

(b) Briefly discuss the applications of titanium and magnesium alloys. (5)

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BTS – III – 11.13 – 1235

B.Tech. Degree III Semester Examination November 2013

ME 1306 MACHINE DRAWING

(2012 Scheme)

(Missing dimensions if any may be assumed)

Time: 4 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

I. (a) Draw profile of BSW thread showing at least three threads. P=36mm and indicate all the standard proportions in terms of P. (10)

(b) Make a neat sketch of both the external and internal square thread taking P=24mm. Show at least three threads. Indicate all the proportions in the drawing. (10)

(c) Draw neat dimensional sketch of Lewis foundation bolt having a diameter of 20mm at the threaded end. Indicate all the proportions in the drawing. (10)

OR

II. Details of a knuckle joint is shown in Fig.1. Assemble them and draw: (30)

(a) elevation (b) plan top half in section (c) side view from left

III. Draw top half sectional elevation of an integral flanged joint for the following specifications: size of the pipe to be joined $=\phi 80$, Outside diameter of the pipe = 100, outside diameter of the flange = 176. Pitch circle diameter of bolts = 140. Size of the bolt = M12. Number of bolts = 6. Thickness of the flange = 20. Thickness of the gasket = 3. All dimensions are in millimeter. Also draw an end view. (30)

OR

IV. Isometric view of a flanged coupling (protected type) is shown in fig.2. Draw the top half sectional elevation and an end view. (30)

V. Fig.3 shows details of a steam stop valve. Assemble and draw: (40)

(a) Right half sectional elevation.
(b) Top half sectional plan, taking section along the centre line of the outlet of the valve.

OR

VI. Fig.4 shows the details of a Lathe tailstock. Assemble the parts and draw : (40)

(a) sectional elevation
(b) plan

(Figures overleaf)

(P.T.O.)