Date: 11/04/2023

(15)

(20)

(35)

Time: 3 Hours

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2021-2022

Sub: NAME 219 (Marine Engines and Fuels)

Full Marks: 210

The figures in the margin indicate full marks

The symbols have their usual meanings. Assume reasonable value of any data if missing. USE SEPARATE SCRIPTS FOR EACH SECTION

<u>SECTION – A</u>

There are FOUR questions in this section. Answer any THREE questions.

- (a) Why the cylinder scavenging process is much more critical in a two-stroke engine than in a four-stroke engine? Explain with the necessary diagrams. (15)
 (b) In on IC engine, it is essential to open and close the valves precisely to run the engine efficiently. Broadly describe the system which controls the operation of the valves by using the sketch if the whole system along with the views of individual components of the system. (20)
- (a) Why don't we use a high compression ratio in the SI engine? Draw the crosssection of a basic carburetor and illustrate how the full load and the part-load conditions are achieved by the throttle valve mechanism in an engine.
 - (b) Write short notes on the followings-
 - (i) Pre-flame combustion period
 - (ii) Turbo lag
 - (iii) Compression ring and oil ring
 - (iv) Over square engine and under square engine

3. (a) How electricity is produced in a hydro-electric power plant and why it is considered a source of renewable energy? Briefly explain which component distinguishes the liquid-dominant geothermal power plant from the vapour-dominant system. (15)
 (b) Differentiate between viscosity index and viscosity grading in an elaborate manner. Classify the types of lubricating oil reservation in a compression ignition engine using neat sketches. (20)

- 4. A three-liter SI V6 square engine is operating on a four-stroke cycle at 3600 RPM. At this speed, air enters the cylinders at 85 kPa and 60°C. A dynamometer connected to the engine is giving a brake output torque reading of 205 N-m at 3600 RPM. The engine is running with an air-fuel ratio of 15, fuel heating value of 44000 kJ/kg, compression ratio of 9.5, combustion efficiency of 97% and mechanical efficiency of 85%. Calculate-
 - (i) Clearance volume of each cylinder
 - (ii) Indicated power (in hp unit)
 - (iii) Friction mean effective pressure (in psi unit)
 - (iv) Brake work per unit mass of gas in the cylinder (in BTU/lbm unit)
 - (v) Indicated thermal efficiency
 - (vi) Volumetric efficiency
 - (vii) Brake specific fuel consumption (in lbm/hp-hr unit).

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<u>SECTION – B</u>

There are FOUR questions in this section. Answer any THREE questions.

5.	(a) Define Calculated Carbon Index. A heavy fuel oil at 15°C has a density of 991	
-	kg/m ³ and a viscosity of 2.9 CST. Can this fuel be used in a ship or not? Justify your	
	answer.	(13)
	(b) Describe the 4 major problems related to the use of the Heavy Fuel Oil in marine	
	engines. Despite of having these problems why HFO is used in marine engines as	
	primary fuel?	(15)
	(c) What is Governor? Why it is more important in CI engine rather than SI engine?	(7)
6.	(a) Define Octane number and cetane number. What will happen if we use high octane	
	number fuel than specified?	(7)
	(b) An 8 cylinder 2-stroke C.I. engine develops 220 KW power at 1200 rpm with brake	
	specific fuel consumption of 0.273 kg/KWh. The diameter of the single hole injector	
	nozzle is 0.8 mm. The period of injection is 30° of crank angle. Specific gravity of fuel	
	= 0.85 and the orifice discharge co-efficient = 0.9 . Determine the pressure difference	
	required to be created by nozzle for injecting the fuel into the cylinder.	(18)
	(c) Describe the working principle of the 'Energy Cell' combustion chamber in C.I.	
	engine with schematic diagram.	(10)
7.	(a) Describe the 7 major differences between the Open and Divided combustion	
	chambers.	(15)
	(b) Explain the functions of all the components used in a typical water-cooling system	
	elaborately and draw a schematic diagram of that system.	(20)
8.	(a) Derive the expression for the maximum net-work output of the Brayton cycle with	
	Reheater, if the inlet temperatures of the high-pressure and low-pressure turbine are	
	equal, and the ratio of the maximum and minimum temperature remains constant.	(20)
	(b) Draw a schematic diagram of a Brayton cycle with the heat exchanger, reheater and	
	intercooler. Also draw the T-S diagram.	(15)

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Date: 30/04/2023

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2021-2022

Sub: NAME 251 (Mechanics of Structures)

Full Marks: 210

Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

<u>SECTION – A</u>

There are FOUR questions in this section. Answer any THREE questions.

(a) The composite bar as shown in Fig. for Q. No. 1(a) is stress-free before the axial loads P₁ and P₂ are applied. Assuming that the walls are rigid, calculate the stress in each material if P₁ = 150 kN, P₂ = 90 kN and the right wall yields 0.80 mm.
 (b) A homogeneous rigid block weighing 12 kips that is supported by three symmetrically placed rods as shown in Fig. for Q. No. 1(b). The lower ends of the rods were at the same level before the block was attached. Determine the stress sin each rod after the block is attached and the temperature of all bars increases by 100°F. Use the following data:

	$A(in.^2)$	E (psi)	<i>a</i> (/°F)
Each steel rod	. 0.75	29×10^{6}	6.5×10^{-6}
Bronze rod	1.50	12×10^{6}	10.0×10^{-6}

(c) The 4-mm-diameter cable BC is made of a steel with E = 200 GPa. Knowing that the maximum stress in the cable must not exceed 190 MPa and that the elongation of the cable must not exceed 6 mm, find the maximum load P that can be applied as shown in Fig. for Q. No. 1(c).

- 2. (a) Determine by the double-integration method, the maximum deflection for a simply-supported beam of L ft. long, loaded uniformly with w lb/ft. (Assume, E and I constant)
 (b) For the uniform beam AB as shown in Fig. for Q. No. 2(b), (i) determine the reaction at A (ii) derive the equation of the elastic curve, and (iii) determine the slope at A. (None that the beam is statically indeterminate to the first degree)
- (a) Plot the shear-force and bending-moment diagrams for the beam loaded as shown in Fig. for Q. No. 3(a). State the maximum magnitudes of shear force and bending moment of the beam.

(b) A 2 *m* long pin-ended column of square cross section is to be made of wood. Assuming E = 13 GPa, $\sigma_{allow} = 12$ MPa, and using a factor of safety of 2.5 in computing Euler's critical load for buckling, determine the size of the cross section if the column is to safely support a 100 kN load.

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4. (a) A 5-m-long, simply supported steel beam AD is to carry the distributed and concentrated loads as shown in Fig. for Q. No. 4(a). Knowing that the allowable normal stress for the grade of steel to be used is 160 MPa, select the wide-flange shape that should be used.

(b) A beam with cross-section as shown in Fig. for Q. No. 4(b) is loaded in such a way that the maximum moments are $\pm 1.0P$ lb. ft and $\pm 1.5P$ lb. ft, where P is the applied load in pounds. Determine the maximum safe value of P if the working stresses are 4 ksi in tension and 10 ksi in compression.

SECTION – B

There are FOUR questions in this section. Answer any THREE questions.

Assume reasonable value for missing data if any.

5.	(a) Derive the relationship between the followings:	(10)
	(i) Engineering stress and True stress	
	(ii) Engineering strain and True strain	
	(b) Distinguish between the followings:	(10)
	(i) Modulus of toughness and Modulus of resilience	
	(ii) Brittle material and ductile material.	

(c) The state of plane stress at a point is represented by the stress element as shown in Fig. for Q. No. 5(c). Determine the stresses acting on an element oriented 30° clockwise with respect to the original element.

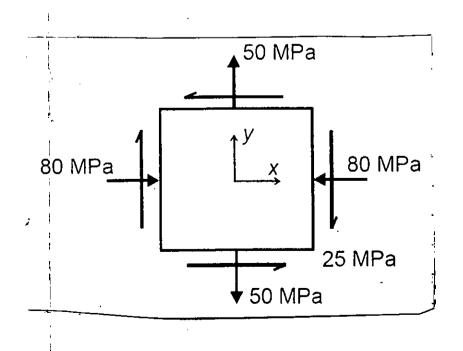


Fig. for Q. No. 5(c)

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6. (a) With necessary assumptions derive an expression for angle of twist of a circular solid shaft.

(b) Knowing that each of the shaft AB, BC and CD consist of solid circular rods as shown in Fig. for Q. No. 6(b), determine (i) the shaft in which the maximum shearing stress occurs, (ii) the magnitude of that stress.

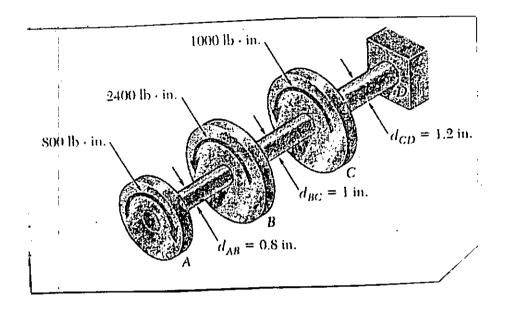


Fig. for Q. No. 6(b)

(c) A 2.50 m long steel shaft of 30 mm diameter rotates at a frequency of 30 Hz. Determine the maximum power that the shaft can transmit, knowing that G = 77.2 GPa, that the allowable shearing stress is 50 MPa, and that the angle of twist must not exceed 7.5°.

7. (a) A beam ABCD is supported by a roller at A and a hinge at D. It is subjected to the loads as shown in Fig. for Q. No. 7(a), which act the ends of the vertical members BE and CF. These vertical members are rigidly attached to the beam at B and C. Compute the support reactions.

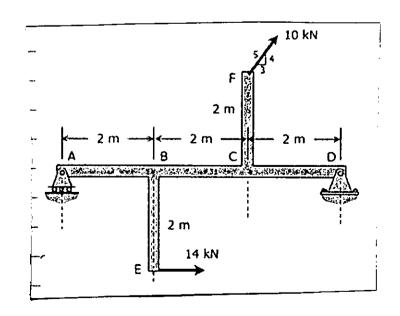


Fig. for Q. No. 7(a)

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<u>NAME 251</u> <u>Contd.... for Q. No. 7</u>

(b) The bridge shown in Fig. for Q. No. 7(b) consists of two end sections, each weighing 20 tons with center of gravity at G, hinged to a uniform center span weighing 12 tons. Compute the reactions at A, B, E and F.

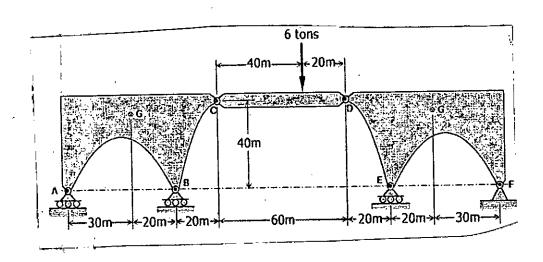


Fig. for Q. No. 7(b)

- (c) Explain buckling and critical buckling stress.
- 8. (a) What would be the moment of inertia about x-axis and y-axis of the shape as sown in Fig. for Q. No. 8(a)?

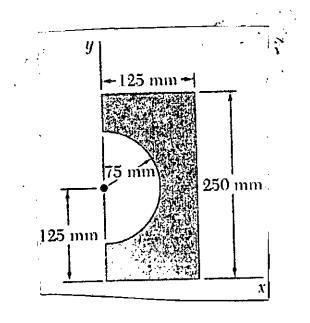


Fig. for Q. No. 8(a)

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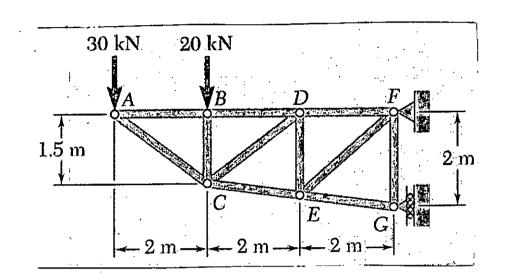
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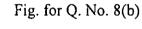
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<u>NAME 251</u> <u>Contd.... for Q. No. 8</u>

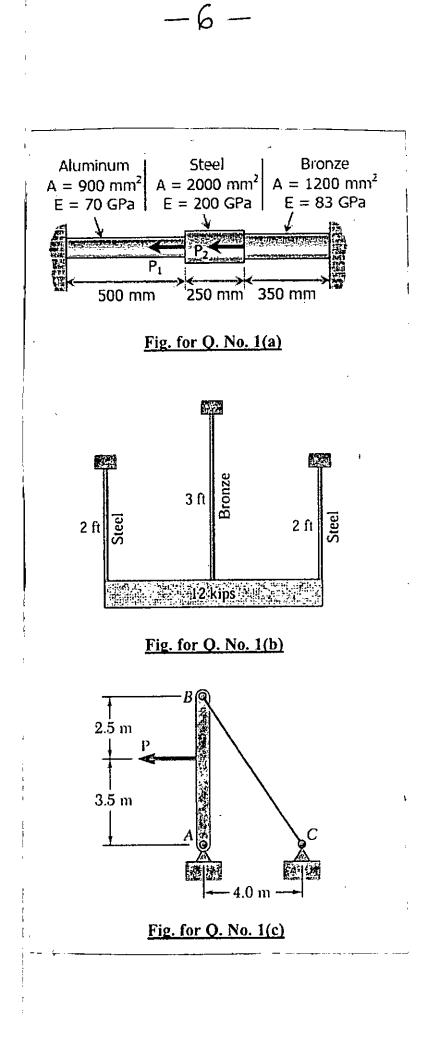
(b) Determine the forces in the members CD, CE, DF, EF and DE of the truss as shown in Fig. for Q. No. 8(b).

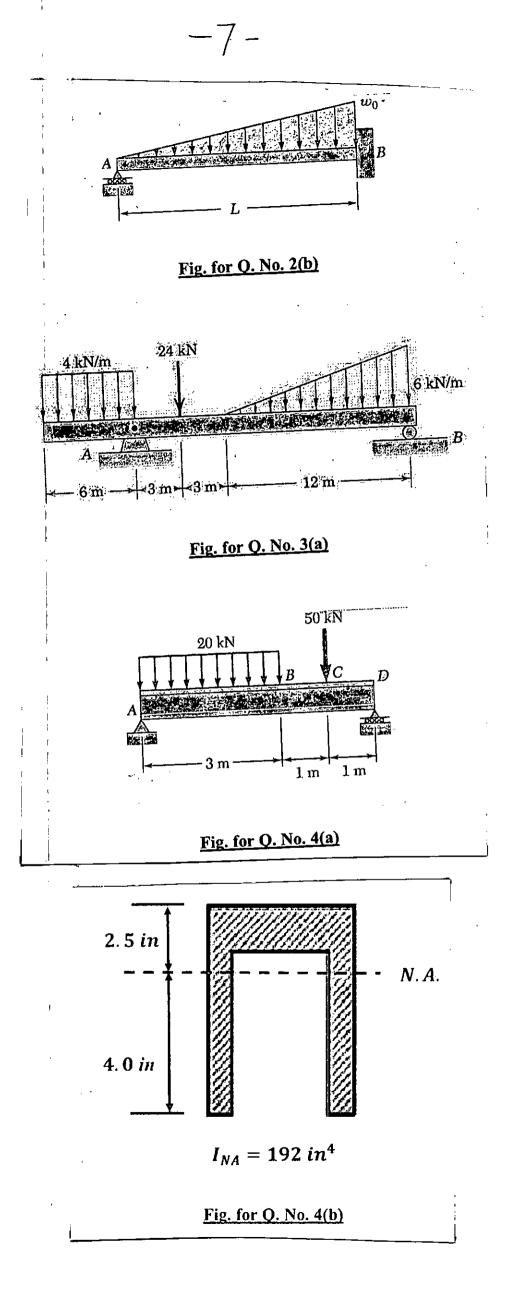




(c) Define principal stress and principal plane.

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_	Designation	Mais (kg/m)	Area (mm²)	Depth (exe)	Width (com)	Thickness (mm)	thickness (mm)	/ (10 ⁴ mm ⁴)	S = <i>l c</i> (10 ³ mm ³)	$r = \sqrt{1/A}$	/ (10 ⁴ mm ⁴)	S = Ije (10 ³ mm ³)	r=√∏7 (mm)
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	× 52	\$2.0	6650	318	167	13.2	7.62	119	747	133	10.2	122	39.1
	× 44.5	44.5	5670	312	166	11.2	6.60	99.1	633	132	8.45	102	38.6
	¥ 38.7	38.7	4 940	310	165	9.65	5.84	84.9	547	131	7.20	87.5	38.4
	< 32_7	32,7	4 180	312	102	t0,8	6.60	64.9	416	125	1.94	37.9	21.5
	= 28.3	28.3	3 590	310	102	8,89	5.97	54.1	349	122	1.57	30.8	20,9
	× 23.8	23.8	3040	305	101	6.73	5.59	42.9	280	119	1.17	23.1	19,6
	× 21	21.0	2 680	302	101	5.72	5.08	36,9	244	117	0.982	19.5	19.1
	W250 × 167	167	21 200	290	264	31.8	19.2	298	2060	118	98.2	742	68.l
	× 149	149	19000	282	262	28.4	17.3	259	1840	117	86.2	655	67.3
	× 131	131	16700	274	262	25.1	15.4	222	1610	115	74.5	570	66.8
	× 115	115	14 600	269	259	22.1	13.5	189	1410	114	64,1	493	66.0
	× 101	101	12900	264	257	19.6	11.9	164	1 240	113	55.8	433	65.8
	× 89	89,0	11 400	259	257	17.3	10.7	142	1090	112	48.3	377	65.3
	< 80	80.0	10 200	257	254	15.6	9.40	126	983	111	42.9	338	65.0
	× 73	73.0	9 290	254	254	14.2	8.64	113	895	110	38.9	306	64.5
	× 67	67.0	8 580	257	204	15.7	8.89	103	805	110	22.2	218	51.1
	× 58	58.0	7420	252	203	13.5	8.00	87.0	690	108	18.7	185	50.3
	× 49.1	49.1	6 260	247	202	11.0	7.37	71.2	574	106	15.2	151	49.3
	× 44.8	44.8	5 700	267	148	13.0	7.62	70.8	531	111	6.95	94.2	34.8
	× 38.5	38.5	4910	262	147	11.2	6,60	59.9	457	110	5.87	80,1	34.5
	× 32.7	32.7	4 190	259	146	9.14	6,10	49,1	380	108	4.75	65.1	33.8
	× 28.4	28.4	3630	259	102	10.0	6.35	40.1	308	105	1.79	35.1	22.2
	× 25.3	25,3	3 220	257	102	8,38	6.10	34.1	265	103	1.48	29.2	21.5
	< 22.3	22,3	2850	254	102	6.86	5.84	28.7	226	100	1.20	23.8	20.6
	× 17.9	17.9	2 280	251	101	5.33	4.83	22.4	179	99.1	0.907	18.0	19.9
,	W200 × 100	100	12 700	229	210	23.7	14.5	113	990	94.5	36.9	351	53.8
	. ≍ 86	86.0	11 000	222	209	20.6	13.0	94.9	852	92.7	31.3	300	53,3
	× 71	71.0	9100	216	206	17,4	10.2	76.6	708	91.7	25.3	246	52.8
	x 59	59.0	7 550	210	205	14,2	9.14	60.8	582	89.7	20.4	200	51.8
	× 52	52.0	6 6 50	206	204	12.6	7.87	52.9	511	89.2	17.7	174	51.6
	x 46.1	46.1	5 880	203	203	11.0	7.24	45.8	451	88.1	15.4	152	51.3
	× 41.7	41.7	5 320	205	166	11.8	7.24	40.8	398	87.6	9.03	109	41.1
	× 35.9	35.9	4 570	201	165	10.2	6.22	34,4	342	86.9	7.62	92.3	40.9
	× 31.3	31.3	3 970	210	134	10.2	6.35	31.3	298	88,6	4.07	60,8	32.0
	26.6	26.6	3 390	207	133	8_18	5.84	25.8	249	87.1	3.32	49,8	31.2
	× 22.5	22.5	2 860	205	102	8.00	6.22	20.0	193	83.6	1.42	27.9	22.3
	× 19.3	19.3	2480	203	102	6.48	5,84	16.5	162	81.5	1.14	22.5	21.4
	× 15	15.0	1910	200	100	5.21	4.32	12.8	128	81,8	0.870	17,4	21.4

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TABLE B-2 Properties of Wide-Flange Sections (W-Shapes): SI Units (continued)

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38.6 7.12 91,9 <u>22.2</u> 274 68.6 W150 x 37.1 4740 162 154 11.6 8.13 37.1 17.2 38.1 72.3 3790 6,60 220 67.6 5.54 × 29.8 29.8 157 153 9,27 159 51.0 36.8 3.88 × 22.5 22.5 2860 152 152 6.60 5.84 12.1 65.0 1.84 --- 36:1----24.6 3060 10.3 6.60 13.4 167 -----66.0 24.0 160 102 ••• 63.2 1.24 24.6 23.3 120 18.0 2 290 153 102 7.11 5.84 9.20 × 18 62.7 0,916 18.2 23.0 4.32 6.83 91.1 × 13.5 13.5 1730 150 100 5.46 22.6 4.32 6.20 83.6 61.7 0.828 16.6 × 13 13.0 1630 148 100 4.95 32.5 6.86 55.1 3.80 59.5 10,9 167 W130 × 28.1 28.1 3 590 131 128 10.9 \$4.1 3.13 32.0 6.10 8,91 140 49,2 x 23.8 23.8 3040 127 127 9,14 43.7 1.61 31.1 25.4 89.5 W100 x 19.3 19.3 2470 106 103 8.76 7.11 4.70

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Date: 28/03/2023

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2021-2022

Sub: MME 293 (Shipbuilding Materials)

Full Marks: 210

Time: 3 Hours

The figures in the margin indicate full marks USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are FOUR questions in this section. Answer any THREE questions.

- 1. (a) A cylindrical specimen of steel (E = 210 GPa) having an original diameter of 12.8 mm is tensile tested to fracture and found to have an engineering yield strength of 300 MPa and an engineering fracture strength of 460 MPa. If its cross-sectional diameter at fracture is 10.7 mm, determine: (i) the ductility of the steel, (ii) the true stress at fracture and (iii) the true strain at yield point. (5+5+5=15)(b) "Obstructing the motion of dislocations is the main goal of various strengthening processes used for metal" - Justify the assertion correlating with various metal strengthening mechanism. (20)2. (a) Both gray cast iron and nodular cast iron are solidification products. What is the basic difference between the two production parameters that is responsible to produce graphite flake in gray cast iron and spheroidal graphite in nodular cast iron? Compare the properties and applications of gray cast iron and nodular cast iron. (15)(b) Suppose you have to choose a suitable material for sea water environment from the following copper base alloys. Select one among the three materials with appropriate reasoning(s): (i) 70Cu - 30Zn, (ii) 60Cu - 38Zn - 2Pb and (iii) 60Cu - 39.25Zn -0.75Sn. (13)(c) How does sensitization affect stainless steel? (7) 3. (a) Select and outline an NDT method suitable for detecting internal defect of a great. (15)(b) What problems do you face with sand cast magnesium alloys? How can you minimize these problems? (10)(c) Relate the microstructural characteristics of maraging steel with its mechanical properties. (10)4. (a) Which of the common defects is most detrimental to timber? Place argument in favour of your choice. (10)(b) Describe the factors that affect T_g of glass. (10)(c) Select and describe a suitable process for manufacturing multiple polypropelyne
 - (PP) boxes. (15)

Contd P/2

<u>MME 293/NAME</u>

SECTION – B

There are FOUR questions in this section. Answer any THREE questions.

5. (a) Metals X and Y of melting points 750°C and 920°C respectively are mutually soluble (completely) in the liquid state but partially soluble in the solid state. At 400°C a eutectic composition is formed with 60% X and 40% Y. At eutectic temperature the solubility of Y in X is 20% and that of X in Y is 15%, while at 0°C the solubility of Y in X is 8% and that of X in Y is 5%. Solid solution of Y in X is known as α phase and that of X in Y is known as β phase.

Draw the X-Y equilibrium phase diagram on graph paper, assuming all the liquidus and solidus lines to be straight and label all the phase fields.

(12)

(15)

(8)

(b) Sketch and label the slow cooled microstructure of a 0.3% C and a 0.9% C steel at room temperature. Considering the composition of pearlite to be 0.76% C and that of ferrite to be 0.008% C which steel will contain more pearlite? Comment, with reasoning, on the mechanical properties of these two steels.

(c) The microstructure of an iron-carbon ally (steel) consists of pro-eutectoid ferrite and pearlite; the mass fractions of these microconstituents are 0.20 and 0.80, respectively. Determine the concentration of carbon in this alloy. Also, calculate the mass fraction of total ferrite and total cementite in the identified steel.

- 6. (a) Explain how coring occurs with reference to copper-nickel phase diagram. Explain the problem associated with a cored structure and give a method of its rectification. (17)
 (b) Sketch and label the microstructural changes that occur in 0.35% C steel during equilibrium cooling from 900°C to room temperature. (18)
- (a) Explain how a normalized hypoeutectoid steel achieve more hardness & strength than the annealed one. (13)
 (b) Explain the steps involved in steel making in an LD converter. Also, discuss its advantages and disadvantages. (15+7=22)
- 8. (a) Discuss the functions of each raw material used in a blast furnace and hence give an overview of pig iron production in a blast furnace. (13)
 (b) Explain the term "hardenability". How can the hardenability of steel be increased? (7)

(c) How would you harden a surface by nitriding? Explain the advantages and disadvantages of nitriding over carburizing. (15)

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Date: 04/04/2023

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2021-2022

Sub: MATH 281 (Vector Analysis and Differential Equation)

Full Marks: 210

Time: 3 Hours

The figures in the margin indicate full marks

Symbols used have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

<u>SECTION – A</u>

There are FOUR questions in this section. Answer any THREE questions.

1. (a) Solve the differential equation $(x^2D^2 - 2xD + 2)y = x^2 + \sin(5\ln x)$. (18)

(b) Solve
$$[xD^2 + (1-x)D - 2(1+x)]y = e^{-x}(1-6x)$$
 by the method of operational factors. (17)

2. Use the method of Frobenius to find solutions of the differential equation (35)

$$2x^{2}\frac{d^{2}y}{dx^{2}} - x\frac{dy}{dx} + (x-5)y = 0$$

- 3. (a) Prove that $P_n(x)$ is the coefficient of t^n in the expansion of $(1-2xt+t^2)$ in ascending power of t.
 - (b) Establish the recurrence relation

$$(2n+1)xP_n(x) = (n+1)P_{n+1}(x) + nP_{n-1}(x)$$

Hence prove that $\int_{-1}^{1} x^2 P_n^2(x) dx = \frac{1}{8(2n-1)} + \frac{3}{4(2n+1)} + \frac{1}{8(2n+3)}$.

4. (a) Prove that

(i)
$$xJ'_{n}(x) = nJ_{n}(x) - xJ_{n+1}(x)$$

(ii) $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$

(b) Show that

$$J_n(x) = \frac{1}{\pi} \int_0^{\pi} \cos(n\varphi - x\sin\varphi) d\varphi$$
, when *n* is a positive integer.

Contd P/2

(17)

(18)

(20)

MATH 281/NAME

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<u>SECTION – B</u>

There are **FOUR** questions in this section. Answer any **THREE** questions.

5.	(a) Prove that the area of the triangle formed by joining the mid-point of one of the	
	non-parallel sides of a trapezium to the extremities of the opposite side is half of that of	
	the trapezium.	(15)
	(b) Show that the vectors $A = 2i + j - 3k$, $B = i - 4k$ and $C = 4i + 3j - k$ are linearly	
	dependent. Determine a relation among them and hence show that the terminal points	
	are collinear.	(10)
	(c) A force of 15 units acts through point A $(4, 1, -3)$ in the direction of the vector $(3, -3)$	
	1, 5). Find its moment about the point B $(2, -3, -1)$ and the moment about axes	
	through that point parallel to the co-ordinate axes.	(10)
6.	(a) If $P = A\cos kt + B\sin kt$, where A and B are constant vectors and k, a constant	
	scalar, then find $\frac{d^2 P}{dt^2} + k^2 P$.	(10)
	(b) State and prove Frenet-Serret formulae.	(15)
	(c) Solve the vector equation $\mathbf{a} \times \mathbf{x} + \mathbf{a}(\mathbf{a} \cdot \mathbf{x}) + \mathbf{b} = 0$ for the vector \mathbf{x} .	(10)
7.	(a) Find the acute angle between the surfaces $xy^2z = 3x + z^2$ and $3x^2 - y^2 + 2z - 1 = 0$	
		(1.0)
	at (1, -2, 1).	(10)
	(b) Find $\nabla^2(r^n \mathbf{r})$ where \mathbf{r} is the position vector.	(15)
	(c) Show that $\nabla \times (\mathbf{A} \times \mathbf{B}) = \mathbf{A}(\nabla \cdot \mathbf{B}) - \mathbf{B}(\nabla \cdot \mathbf{A}) - (\mathbf{A} \cdot \nabla)\mathbf{B} + (\mathbf{B} \cdot \nabla)\mathbf{A}$	(10)
8.	(a) Find the work done by the force field F on a particle that moves along the curve C	
	where $\mathbf{F} = (3x^2 - 2y)\mathbf{i} + (y^2 + 3x^2)\mathbf{j} + (2zy - 5x)\mathbf{k}$ and C is the curve defined by line	
	segments from $(0, 0, 0)$ to $(1, 2, -1)$ to $(-2, -1, -3)$.	(15)
	(b) State and verify the Gauss divergence theorem for $\mathbf{F} = 2x^2 y \mathbf{i} - y^2 \mathbf{j} + 4xz^2 \mathbf{k}$ taken	
	over the region in the first octant bounded by $y^2 + z^2 = 9$ and $x = 0, x = 3$.	(20)

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Date: 06/05/2023

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(10)

(10)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2021-2022

Sub: HUM 113 (Economics)

Full Marks: 140

Time: 3 Hours

The figures in the margin indicate full marks

Symbols indicate their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

<u>SECTION – A</u>

There are FOUR questions in this section. Answer any THREE questions.

1. •	(a) Define demand function.	(5)
	(b) What are the main determinants of demand? Explain.	(10)
	(c) What are the exceptions to the law of demand?	(81/3)
**		
2.	(a) Show that price elasticity of demand varies from zero to infinity along any straight	

line demand curve. Explain graphically.

(b) From the following table calculate elasticity of demand if you move from point A to C and explain what you understand from the result.

POINT	Ру	Qx
· A	500	150
B	600	160
С	700	170

- 3. (a) What is an indifference curve? Explain the properties of an indifference curve. (15)
 (b) Consumers attain equilibrium at the point of tangency between the indifference curve and the budget line-discuss. (8¹/₃)
- 4. (a) How is price determined in an open economy? What will happen to the price and quantity due to change in demand?

(b) From the following demand and supply functions, calculate equilibrium price and quantity and show that result in a graph. $(13 \frac{1}{3})$

$$P = 0.40 Q + 20$$

 $P = -0.30 Q + 90$

- (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of TK 10?
- (ii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.

Contd P/2

HUM 113/NAME

SECTION – B

There are FOUR questions in this section. Answer any THREE questions.

- (a) Clarify the concepts of 'short run' and 'long run' in the theory of production and explain the law of diminishing marginal returns in production. (10)
 (b) Describe the relationship between total physical product (TPP), average physical product (APP) and marginal physical product (MPP). Use diagrams. (13¹/₃)
- 6. (a) What are the possible situations that firms usually experience in terms of returns to scale (RTS) of production? Describe them and explain the economies and diseconomies of scale of production with reference to RTS. (10)
 (b) Describe the loss minimizing point and the shut-down point under perfect competition. The following are respectively the Average Revenue (AR) and Total Cost (TC) functions of a firm. (13^{1/3})

 $AR = 1400Q^{-1} - 7.5Q$ $TC = Q^3 - 6Q^2 + 140Q + 750$

Find the maximum profit maximizing level of output and maximum profit.

7. (a)Distinguish between the terms given below (10)Gross Domestic Product (GDP) and Gross National Income (GNY) (i) Consumer Price Index (CPI) and GDP deflator. (ii) (b) What is inflation? Describe the causes and consequences of inflation. How is $(13\frac{1}{3})$ inflation measured? Explain with hypothetical data. Write Short Notes on any THREE of the following 8. $(23 \frac{1}{3})$ (i) Short run and long run cost curves (ii) Monopolistic competition market (iii) National income accounting

(iv) Fiscal Policy and Monetary Policy

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